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PROTEIN REQUIREMENT AS DETERMINED IN DIABETIC CHILDREN *

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In formulating optimum diets for children, it has been considered necessary to prescribe high protein as a primary food factor essential for normal growth and development. The aim of this investigation was to determine the actual minimum protein requirement in children. This may be defined as that amount of protein which will establish a positive nitrogen balance, prove adequate for growth in stature, promote normal development, and allow the child to gain weight at a normal rate. In order to establish this minimum protein requirement, advantage has been taken of various protein-sparing factors.

An excellent opportunity for this work was offered by a group of diabetic children, since they were available for study over long periods of time, their diets were accurately controlled, and they could be fed on low protein, high caloric diets, with both therapeutic and experimental advantage.

The protein consumption of normal children has been estimated by Holt [1] to vary from 2 to 4 Gm. of protein per kilogram of body weight; 2 Gm. in adolescence and 4 Gm. in infancy and childhood. Boyd [2] was able to establish nitrogen equilibrium in a boy, aged 13, at rest in bed, receiving 1.25 Gm. of protein per kilogram of body weight. With this one exception, there is no available information on the actual protein requirement of children.

Children require more protein per kilogram than adults because they must grow and develop, but it is not likely that they should require from 300 to 400 per cent more than the generally accepted adult requirement of 0.66 Gm. per kilogram to fulfil these additional requirements.

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1. Holt, L. E.: The Protein Requirements of Children, Arch. Pediat. **38**:425, 1921.

2. Boyd, G. L.: Treatment of Diabetes in Children, Am. J. Dis. Child. **29**:329 (March) 1925.

TECHNIC

The metabolism ward in which these patients were observed fulfilled all the requirements for accurate metabolic study as outlined by Gephart and Du Bois.[3] All data here presented concerning diets represent only food actually ingested by the patient. Food analyses which were employed were taken from the tables compiled by Atwater and Bryant,[4] and were checked repeatedly by the determination of the total nitrogen content of duplicate diets.

The diets used to control these diabetic children differed only slightly from those reported in detail by Newburgh and Marsh.[5] Definite metabolism periods were marked off during which food nitrogen, stool nitrogen and urinary nitrogen determinations were made. Urinary nitrogen determinations were made daily, and all nitrogen determinations reported were done by the macro-Kjeldahl method, using potassium and copper sulphates as catalyzers, or the Folin-Wright modification.[6] Daily weights and bimonthly measurements of height were recorded.

Nitrogen balance was calculated by subtracting the urinary and fecal nitrogen from the food nitrogen, as has been done by Boyd,[2] by Newburgh, Marsh and Holly,[7] and by McCann.[8] During periods when stool nitrogen determinations were not done, an arbitrary factor, considerably in excess of the actual determinations, 0.750 Gm. of nitrogen daily, has been added.

The patients were placed at first on a low caloric diet with only 0.6 to 1.0 Gm. of protein per kilogram of body weight. When the urine became sugar-free and the blood sugar fell to a normal fasting level of 80 to 120 mg. per hundred cubic centimeters, nitrogen studies were begun. After a week or two the diet was gradually raised in calories by increasing the fat content, and, to a lesser degree, the carbohydrate content of the diet, until nitrogen metabolism reached a minimum. The patients were then studied over periods varying from four to eight months, their protein intake being kept at a constantly low

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3. Gephart, F. C., and Du Bois, E. F.: Clinical Calorimetry. Third Paper. The Organization of a Small Metabolism Ward, Arch. Int. Med. **15**:829 (May) 1915.

4. Atwater, W. O., and Bryant, A. P.: The Chemical Composition of American Food Materials, Bulletin no. 28 (Revised Edition), United States Bureau of Agriculture, 1906.

5. Newburgh, L. H., and Marsh, P. L.: The Use of a High-Fat Diet in the Treatment of Diabetes Mellitus, Arch. Int. Med. **26**:647 (Dec.) 1920; ibid. **27**:699 (June) 1921; ibid. **29**:97 (Jan.) 1922; ibid. **31**:455 (April) 1923. Marsh, P. L., and Waller, H. G.: The Relation Between Ingested Fat and the Lipemia of Diabetes Mellitus, Arch. Int. Med. **31**:63 (Jan.) 1923.

6. Folin, O., and Wright, L. E.: A Simplified Macro-Kjeldahl Method for Urine, J. Biol. Chem. **38**:461 (July) 1919.

7. Marsh, P. L.; Newburgh, L. H., and Holly, L. E.: The Protein Requirement in Diabetes, Arch. Int. Med. **29**:97 (Jan.) 1922.

8. McCann, W. S.: The Protein Requirement in Tuberculosis, Arch. Int. Med. **29**:33 (Jan.) 1922.

level. It was thus possible to demonstrate the protein-sparing action of the ingestion of fat which has been noted by Thomas,[9] and reported recently by Petren.[10] Patients were kept in bed while receiving submaintenance diets and allowed full activity on maintenance regimens.

CASE RECORDS

CASE 1.—W. J., an American schoolboy, aged 8 years, entered the metabolism ward, Jan. 14, 1925. He had been in good health until two months prior to his admission, when he had first noted constant fatigue, polydipsia, polyuria and loss of weight. His physician placed him on a diet of 1,350 calories and rendered his urine free from sugar. His past and family history were negative.

Examination showed a slightly undernourished boy with a flushed face, who was cyanotic and slightly hyperpneic. He had an acetone breath, a blood sugar

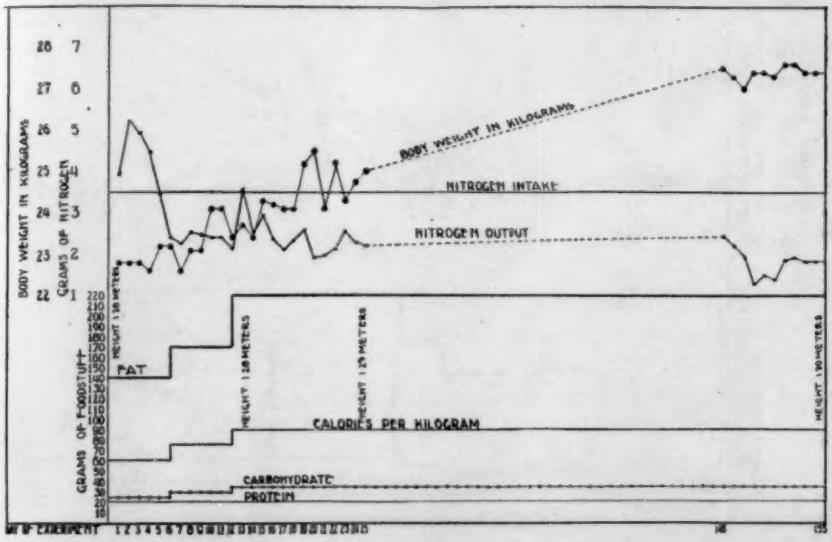

Chart 1.—Daily record of the data obtained from a study of the nitrogen intake and output in case 1 during the first 155 days of treatment. Dotted lines indicate the period during which determinations were not made.

of 216 mg. per hundred cubic centimeters, and the urine showed 2.4 per cent sugar and a strongly positive diacetic acid reaction.

He was given 0.9 Gm. of protein and 43.6 calories per kilogram during the first two weeks of treatment; the urine became free from sugar on the fifth day, and free from diacetic acid on the seventh day when his fasting blood sugar had reached 116 mg. per hundred cubic centimeters. After two weeks the fat and carbohydrate were increased, the protein remaining constant, until the caloric intake reached 63 per kilogram. Gradually, the diet was further increased until he could tolerate 90 calories per kilogram without the occurrence of glycosuria,

9. Thomas, K.: Ueber die biologische Wertigkeit der Stickstoffsubstanzen in verschiedenen Nahrungsmitteln; Beitrage zur Frage nach dem physiologischen Stickstoffminimum, Arch. f. Physiol. **1**:219, 1909.

10. Petren, Karl: Low Nitrogen Metabolism with Low Carbohydrate Diet in Diabetes, J. Biol. Chem. **61**:355 (Sept.) 1924.

hyperglycemia or ketonuria. During the following six months of observation he maintained a consistently positive nitrogen balance, gained 14 pounds in weight, 3 cm. in height, and developed normally with a constant protein intake of only 0.9 Gm. of protein per kilogram. The patient assumed normal activity during this period without altering his nitrogen balance. Chart 1 shows the nitrogen metabolism studies, daily nitrogen intake and output, the diet in grams of protein, carbohydrate and fat, the calories per kilogram and the growth in height and weight.

CASE 2.—V. N., an American schoolgirl, aged 14 years, entered the hospital in June, 1922. She had been in good health until six months before, when she had noted polyuria, polydipsia, loss of weight and a ravenous appetite. Her treatment during the first two years was inadequate, and she had gone steadily down until December, 1924, when she came to the hospital with a discharging ear. Her past and family histories were irrelevant.

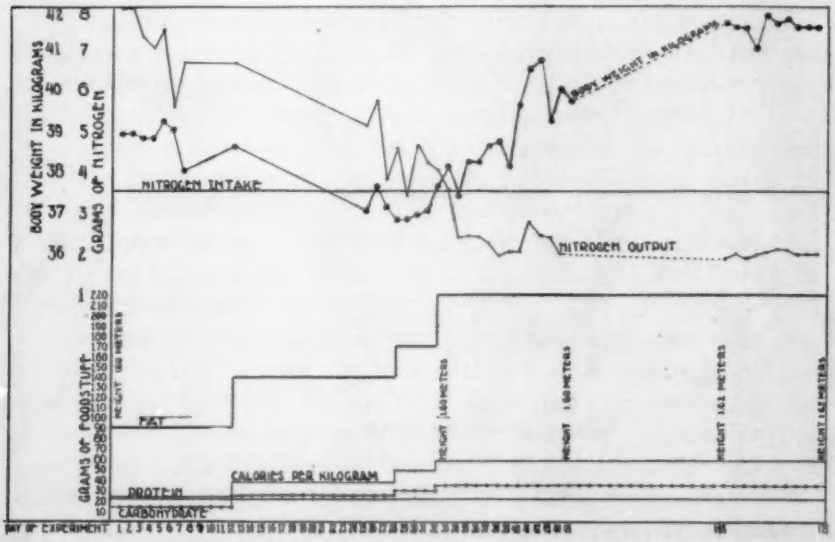

Chart 2.—Daily record of nitrogen metabolism studies during the first 175 days of treatment, showing progressive gain in weight and height, and the establishment of positive nitrogen balance on a diet supplying only 0.6 Gm. of protein per kilogram of body weight.

Examination revealed an undernourished adolescent girl with otitis media in the left ear, subacute nasopharyngitis, a blood sugar of 368 mg. per hundred cubic centimeters; the urine showed 5.2 per cent sugar; the breath was acetone, and a strongly positive diacetic acid reaction was present.

She was given 0.6 Gm. of protein and 25 calories per kilogram during the first three weeks of treatment. The urine became free from sugar on the tenth day and free from diacetic acid on the fourteenth day, when the fasting blood sugar had reached 123 mg. per hundred cubic centimeters. After three weeks the infection had subsided and the fat and carbohydrate were increased, the protein remaining constant, until the caloric intake reached 36 calories per kilogram. Gradually the diet was further increased until she could tolerate 60 calories per kilogram without the occurrence of glycosuria, hyperglycemia or ketonuria. During the following seven months of observation, she maintained a positive nitrogen balance, gained 13 pounds in weight, 2 cm. in height and developed nor-

mally with a constant protein intake of only 0.6 Gm. per kilogram. Normal activity and work were assumed without altering the nitrogen balance or the blood sugar level. Chart 2 shows the nitrogen metabolism studies, the diet in grams of foodstuff, calories per kilogram, and the growth in height and weight.

CASE 3.—L. W., a boy, American, aged 4 years, entered the metabolism ward, March 6, 1925. In January he had scarlet fever, and in February, two weeks prior to his entry, he had first noted polydipsia, polyuria and loss of weight. His brother had died in a diabetic coma at the age of 4 years. Examination showed a slightly undernourished, drowsy child, having an acetone breath, a blood sugar of 288 mg. per hundred cubic centimeters, 2.7 per cent sugar in the urine and a strongly positive diacetic acid reaction.

He was given 0.9 Gm. of protein with 53 calories per kilogram of body weight, during the first two weeks of treatment. The urine became sugar free on the sixth day and free of diacetic acid on the ninth day, when his fasting

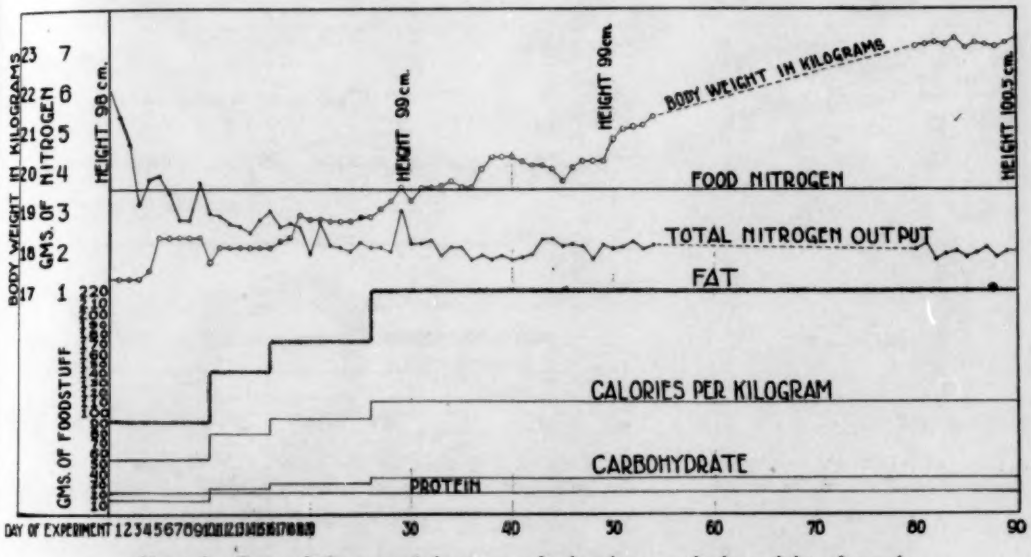

Chart 3.—Part of the record from case 3, showing a gain in weight of nearly 15 pounds, a gain in height of 3 cm., and a strongly positive nitrogen balance over a period of 90 days while the patient was receiving less than 1 Gm. of protein per kilogram of body weight.

blood sugar had reached 98 mg. per hundred cubic centimeters. After two weeks the fat and carbohydrate were increased, the protein remaining constant, until the caloric intake reached 73 per kilogram. Gradually the diet was augmented until he could tolerate 105 calories per kilogram without the occurrence of glycosuria, hyperglycemia or ketonuria. During the following six months of observation, he maintained a positive nitrogen balance, gaining 15 pounds in weight, 3 cm. in height, and developed normally while receiving a constant protein intake of only 0.9 to 1.0 Gm. per kilogram. He assumed normal activity without altering his nitrogen balance or his blood sugar level. Chart 3 shows the nitrogen metabolism studies, the diet in grams or foodstuff and the growth in height and weight.

CASE 4.—J. C., an American schoolboy, aged 8 years, entered the hospital, Jan. 17, 1925. He had been in good health until three weeks before, when he had first noticed increased thirst, polyuria and loss of weight. His past and family

histories were negative. During the first eight months of the disease treatment was inadequate and he became progressively worse until he entered the hospital in September, with a blood sugar of 233 mg. per hundred cubic centimeters, 3.0 per cent sugar in the urine and a strongly positive diacetic acid reaction.

He was given 0.9 Gm. of protein and 42 calories per kilogram during the first sixteen days of treatment. The urine became free from sugar on the second day and free from diacetic acid on the ninth day, when his blood sugar reached 96 mg. per hundred cubic centimeters. The fat and carbohydrate were increased until the caloric intake reached 48 per kilogram. After ten days the fat and carbohydrate were again increased until the caloric intake reached 77 per kilogram, which he was able to tolerate with 25 to 30 units of insulin per day. After twenty days the fat and carbohydrate were again increased, until the caloric intake reached 90 calories per kilogram. It required 40 units of insulin to keep the condition controlled at first, but gradually during several months the insulin dose was decreased to only 14 units, which was sufficient to maintain a normal blood

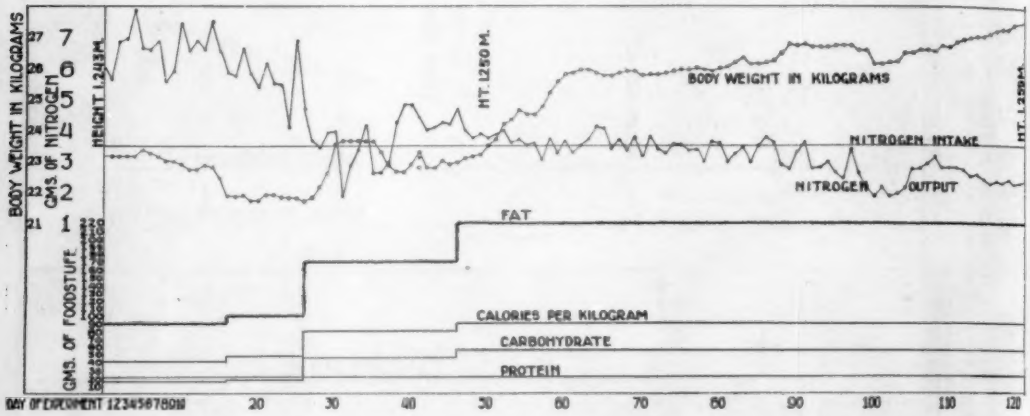

Chart 4.—Part of the record of case 4, showing the gain of 16 pounds in weight, 4 cm. in height, and a period of 180 days of strongly positive nitrogen balance established on a protein intake of scarcely 0.9 Gm. of protein per kilogram of body weight.

sugar. During the following six months of observation, he maintained a normal blood sugar, a positive nitrogen balance, grew 4 cm. in height, gained 16 pounds in weight and developed normally with a constant protein intake of only 0.9 Gm. per kilogram of body weight. The patient assumed normal activity without altering his nitrogen balance or blood sugar level. Chart 4 shows the nitrogen metabolism studies, the diet in grams of foodstuff, calories per kilogram and the growth in height and weight.

CASE 5.—R. B., a boy, aged 5 years, entered the hospital, Oct. 31, 1925. He had been in good health until five months prior to his admission, when it was noted that he was easily fatigued and failed to gain in weight. A month before he had noted polyuria, polydipsia and a voracious appetite. It is of especial interest that his father and older brother both developed diabetes during the preceding six months.

Examination showed a slightly undernourished child with slight acetone breath, blood sugar 181 mg. per hundred cubic centimeters, 0.9 per cent sugar in the urine and a strong diacetic acid reaction. He was given 1 Gm. of protein and

48 calories per kilogram during the first eight days. The urine became sugar free, free from diacetic acid, and his fasting blood sugar descended to 89 mg. per hundred cubic centimeters on the third day. During the following sixteen days, the fat and carbohydrate were increased, the protein remaining constant, until the caloric intake reached 77 per kilogram. Gradually the diet was augmented until he could tolerate from 90 to 100 calories per kilogram without the occurrence of glycosuria, hyperglycemia or ketonuria. During the following six months of observation he maintained a positive nitrogen balance, gained 11 pounds in weight, gained 3 cm. in height, with a constant protein intake of 0.9 to 1.0 Gm. of protein per kilogram. He assumed normal activity during this period without altering the nitrogen balance of his blood sugar level. Chart 5 shows the nitrogen metabolism studies, the diet in grams of foodstuff, calories per kilogram and the growth in height and weight.

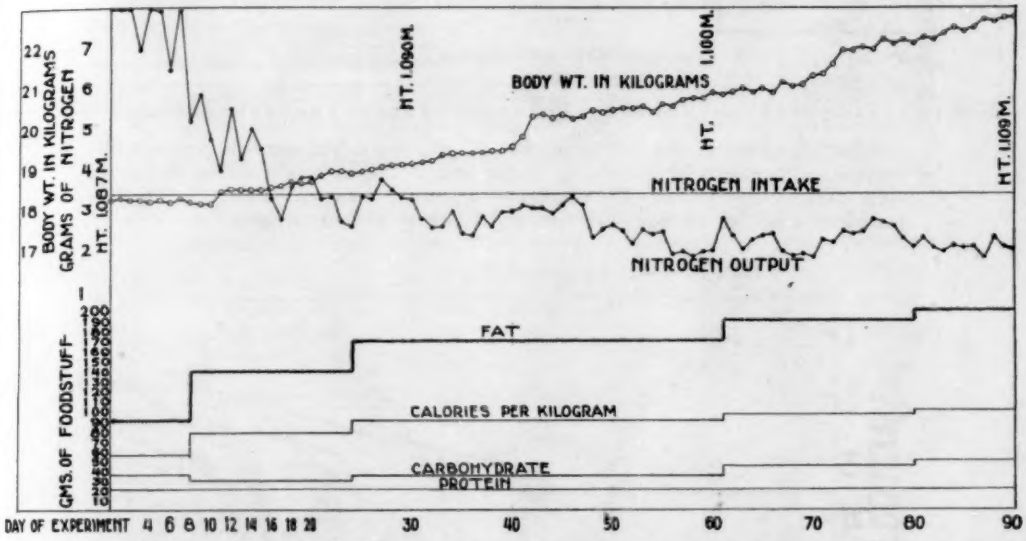

Chart 5.—Part of the record of case 5, a boy, who gained 10 pounds in weight, and grew 2 cm. in height during a four months' stay in the hospital. He received from 1.0 to 0.9 Gm. of protein per kilogram of body weight during this period.

CASE 6.—W. R., an American schoolboy, aged 10 years, entered the hospital, Dec. 1, 1925. He had been in good health until two years before, when he had noticed loss of energy, enuresis, polyuria and polydipsia. His treatment during the first two years was inadequate and he was not under control for any length of time. His past and family history were irrelevant.

Physical examination revealed nothing of importance. Blood sugar on admission was 230 mg. per hundred cubic centimeters; urine showed 1.0 per cent sugar, and a strongly positive diacetic acid reaction; the breath showed no acetone. He was given 0.7 Gm. of protein and 32 calories per kilogram of body weight during the first thirteen days. The urine became sugar free on the eighth day, free from diacetic acid on the fourth day, and on the ninth day his fasting blood sugar reached 110 mg. per hundred cubic centimeters. The fat and carbohydrate were then increased, the protein remaining constant, until he was supplied with 52 calories per kilogram. To increase the diet beyond this point it was found necessary to give insulin, and, with this aid, the diet was gradually increased until he

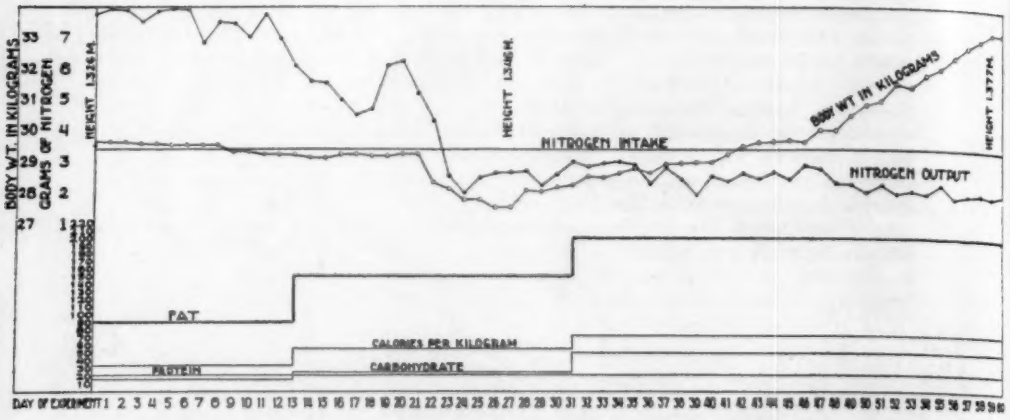

Chart 6.—Part of the record of case 6. W. R., a boy, aged 10 years, with diabetes, who gained 11 pounds in weight and 3 cm. in height during the first sixty days of observation. He maintained a positive nitrogen balance during this period on a protein intake of 0.7 Gm. per kilogram of body weight.

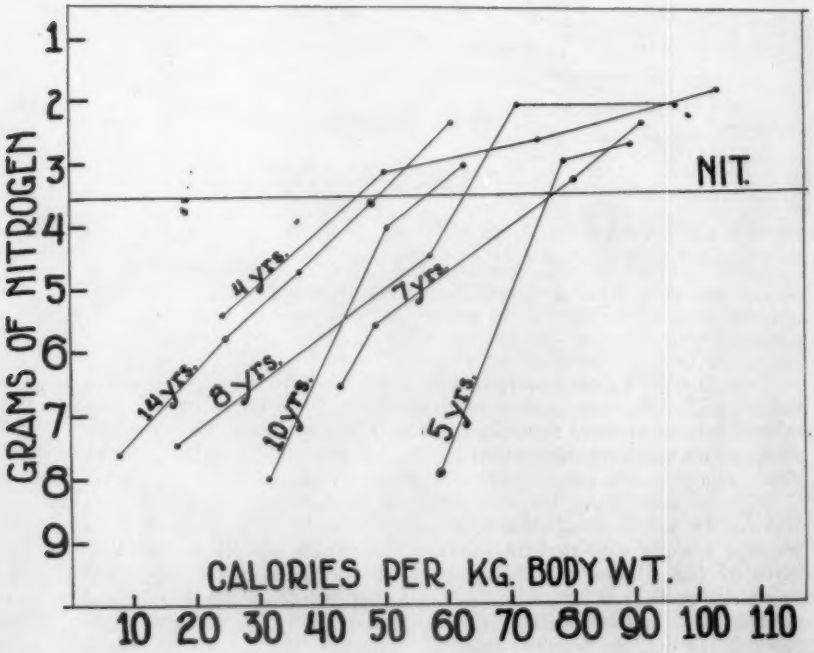

Chart 7.—Relation of caloric intake to nitrogen balance. Nit. = nitrogen intake.

was receiving 80 calories per kilogram. During the following two months of observation he maintained a normal blood sugar, a strongly positive nitrogen balance, gained 11 pounds in weight, grew 3 cm. taller, and developed normally on a constant protein intake of only 0.7 Gm. per kilogram. He assumed normal activity without altering his nitrogen balance. Chart 6 shows the nitrogen metabolism studies.

It will be noted that as the caloric requirement [11] was fulfilled in each case, the child came into positive nitrogen balance and began to gain in weight. The nitrogen equivalent of the protein intake was constant at 3.5 Gm. The average nitrogen excretion per day has been charted against the caloric intake at various levels, and the point at which the child came into positive nitrogen balance represents, as a rule, the caloric requirement of the child.

In table 1, it will be noted that for the most part these comparisons align themselves with the estimations of Holt.[1] Undoubtedly, more protein is required in most of these cases, because the amount of calories per kilogram is correspondingly below the requirement according to Talbot.[11]

TABLE 1.—*Caloric Requirements Compared with Those of Holt*

Observers	Diets in Grams per Kilogram of Body Weight					
	C/Kg.	P/Kg.	F/Kg.	Cal's/Kg.	F : C	
Holt and Fales (normals).....	9.4	2.8	2.8	74	0.3	Average for Children of All Ages
Joslin	2.7	1.9	3.4	49	1.3	
Geyelin	3.3	3.1	5.1	73	1.5	
Mosenthal	3.1	2.2	4.9	67	1.6	
Allen and Sherrill.....	2.7	2.7	4.8	64	1.8	
Sansum	1.9	1.6	4.1	51	2.2	
						Age
Case No. I (this series).....	1.4	0.9	8.8	90	6.3	8
Case No. II (this series).....	0.9	0.6	5.5	60	6.1	14
Case No. III (this series).....	1.7	1.0	11.0	110	6.5	4
Case No. IV (this series).....	2.2	0.9	8.8	90	4.0	8
Case No. V (this series).....	1.7	1.0	8.5	88	5.0	5
Case No. VI (this series).....	1.8	0.7	7.3	76	4.0	10

METABOLISM PERIODS

Table 2 shows the results in six of the metabolism periods, during which food nitrogen, stool and urine nitrogen determinations were made. It will be noted that in each case there is a positive nitrogen balance. In metabolism period no. 2, for experimental purposes 0.5 Gm. of creatine free from creatinine was administered daily. This was suggested by the protein-sparing action of ingested creatine reported by Benedict and Osterberg.[12] It was found that this procedure increased

11. Talbot, F. B.: Studies in Growth: 1. Growth of Normal Children, Am. J. Dis. Child. **27**:541 (June) 1924.

12. Benedict, S. R., and Osterberg, E.: Studies in Creatine and Creatinine Metabolism. V. Metabolism of Creatine, J. Biol. Chem. **56**:229 (May) 1923.

the positive nitrogen balance by nearly 0.5 Gm. of nitrogen daily. Similarly, it has been noted in animals by Asada [13] that the daily administration of 3 Gm. of a mineral salt mixture of the following composition:

	Gm.
Calcium phosphate	100.0
Magnesium citrate	100.0
Potassium chloride	15.0
Ferric citrate	30.0
Iodine	0.05
Potassium iodide	0.10

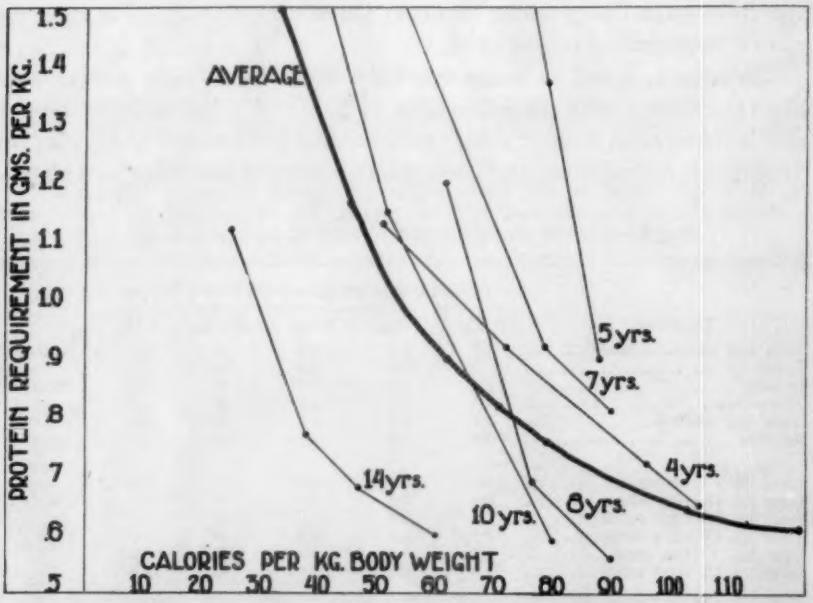

Chart 8.—Protein requirement of children in grams per kilogram of body weight, in relation to their caloric intake in calories per kilogram.

would decrease the urinary nitrogen. This was used over a period of three months in cases 4 and 5, and it was found that it would increase the positive nitrogen balance by 0.5 to 1 Gm. of nitrogen daily. Blood nitrogen studies during the administration of the salt and before were all consistently low, the average nonprotein nitrogen being 21 mg. per hundred cubic centimeters of blood. The fluid output during salt administration was not diminished.

Chart 8 shows the protein equivalent of the nitrogen metabolized by children between the ages of 4 and 14 years on regimens supplying them

13. Asada, K.: Experimentelle Untersuchungen uber den Einfluz der Zellsalze auf Eiweizstoffwechsel, Gaswechsel und Korpergewicht, Biochem. Ztschr. **140**:326, 1923.

TABLE 2.—*Results in Six Metabolism Periods*

Test No.	No. Days	Case No.	Diet: Protein, Gm.	Diet: Fat, Gm.	Diet: Carbohydrate, Gm.	Nitrogen: Food, Gm.	Nitrogen: Urine and Feces, Gm.	Nitrogen: Balance, Gm.	Conditions
1	7	IV	21	220	55	3.214	3.064	+0.150	Diet alone
2	7	IV	21	220	55	3.376	2.821	+0.555	Diet and creatine, 0.5 Gm. daily
3	14	IV	21	220	55	3.295	2.172	+1.123	Salt prescription, 3 Gm. daily
4	7	V	21	170	35	3.521	2.220	+1.301	Diet alone
5	7	IV	21	220	55	3.394	2.941	+0.453	Diet alone
6	7	VI	21	200	50	3.270	2.400	+0.870	Diet alone

with various caloric values. The protein requirement of the cases reported has been charted with the caloric value of the diet ingested, and an average line has been drawn to show the requirement of the average child on any given caloric regimen.

COMMENT

Nursing infants below the age of 1 year consume 1.5 Gm. of protein per kilogram of body weight, as is shown in table 3. This is sufficient for normal growth and development during the period of most active growth.[1] The protein content of mother's milk is very rich in certain amino-acids essential for growth, and thus it is probable that animal proteins, which are also rich in these essential amino-acids, are necessary for normal growth and development. In order to insure growth, as well as maintenance and repair, the protein fed was partly vegetable and partly animal in character. Foods rich in vitamins were supplied in liberal quantities. Cod liver oil was used to advantage in providing a diet rich in fats.

Table 3 shows the protein content to provide 1.5 Gm. of protein per kilogram of body weight, and the caloric value to average about 80 calories per kilogram.

TABLE 3.—*Protein Content in Food of Normal Infants*

Age, Mo.	Av. Amount of Mother's Milk Fed per Day, Cc.	Average Weight, Kg.	Protein, Gm.	Fat, Gm.	Carbohydrate, Gm.	Protein per Kg., Gm.	Calories per Kg.
1 to 6	870	7.14	10.93	30.63	65.63	1.5	81.50
6 to 12	1,000	9.42	13.25	37.10	79.50	1.4	75.00

From chart 8 and table 3, it appears probable that the actual minimum protein requirement in children falls from 1.5 Gm. per kilogram during the first year almost directly proportional to the diminution in the rate of growth, inversely proportional to the age and inversely proportional to the calories given per kilogram for any age until after adolescence when the requirement reaches that of the adult, 0.66 Gm. per kilogram.[7]

It is considered logical to presume that normal children require no more protein than those whose records are herein incorporated, because these children were essentially normal during the period of accurate control. It is common experience that diabetes usually occurs in children who approach the upper normal limits in height at the onset of their disease, and that if they are not accurately controlled do not grow in stature at the usual rate. From this study, it appears that their growth in stature is dependent on their accurate control. In an attempt to determine whether or not there was a disturbance of development in the long bones of these children, roentgenologic examinations of the long bones were made. Nothing was found to which significance could be attached.

It will be noted that in this study the fatty acid: glucose ratio of the diets employed varies between 2.5 and 3.0: 1. This has been found to be compatible with the persistent absence of ketosis in children whose nitrogen metabolism is forced to the minimum by feeding high caloric diets. In order to determine the effect of the fatty acid: glucose ratio on nitrogen metabolism, the following experiment was carried out: Case 4, J. C., was treated for six months on a diet with a fatty acid: glucose ratio of 2.5: 1. This was compatible with persistent absence of ketosis, and the average total nitrogen output reached 2 Gm. daily. He was then abruptly changed to a diet of the same caloric value, the protein intake remained the same, but the fatty acid: glucose ratio was decreased to 1.3: 1 by the substitution of carbohydrate calories for fat calories. The insulin requirement increased, but the nitrogen balance was not changed by the change of fatty acid: glucose ratio. This indicates that the protein requirement is a function of the total calories supplied, and has no direct relationship to the fatty acid: glucose ratio, as it does not exceed that which is compatible with the persistent absence of ketosis.

In cases 1, 2, 3 and 5, the patients have been treated without insulin, while in cases 4 and 6 the condition was so severe that insulin was necessary to insure complete utilization of maintenance diets. Insulin has had no direct effect on the protein requirement, but indirectly by increasing carbohydrate utilization has lowered the protein requirement.

The growth curves reported here invariably start when the children are below normal weight for their age and height, and during the period of study have been brought up to and above the normal limits.

The clinical value of low protein therapy, the subject of a subsequent report, manifests itself in two main disorders of body economy, namely, diabetes mellitus and chronic nephritis with nitrogen retention. Feeding a low protein, high caloric diet in diabetes mellitus maintains nitrogen metabolism at a minimum, decreases the available glucose in the diet and decreases the tendency toward the development of ketosis and hyper-

glycemia.[5, 7, 10] Much clinical experience favors the initiation of low protein therapy in chronic nephritis characterized by retention of nitrogenous waste materials.

CONCLUSIONS

1. Children between the ages of 4 and 14 maintain a positive nitrogen balance, grow in stature, gain weight at a normal rate and develop normally when supplied with 0.6 to 1.0 Gm. of protein per kilogram of body weight, provided (*a*) their caloric requirement is fulfilled, and (*b*) the diet is adequately chosen from foods rich in vitamins.

2. The protein requirement of children is a function of the ingested calories, varying inversely with the caloric intake.

3. The protein requirement of children bears no relationship to the fatty acid: glucose ratio, provided it is compatible with a persistent absence of ketosis.

4. The protein requirement of children varies inversely with the age, and is directly proportional to the rate of growth.

5. It is possible (and in certain cases of diabetes mellitus and chronic nephritis it may be advisable) to feed diets much lower in nitrogen than is usual. Provided the caloric requirements are fulfilled, the diet is rich in vitamins and is adequately chosen from vegetable and animal sources, no evidences of protein starvation will be manifest.

ABSTRACT OF DISCUSSION

DR. JOHN R. WILLIAMS, Rochester, N. Y.: Diabetes in children is comparatively rare, but furnishes a very difficult problem when it does occur. In the treatment of diabetes without insulin, it is generally true that for the first few months, patients will do well. Children will grow slightly and apparently gain in food tolerance. About 50 per cent of children will show a noteworthy improvement over a period of a few months. Toward the middle of the year they will begin to decline, and by the end of the year less than 10 per cent will show any progress. The others will show definite failure. I treated a large number of diabetic children before we had discovered insulin. It was quite impossible to make them grow. I have a series of seven children now alive whom I had under my care before insulin came into use, who, since we began the administration of insulin, have grown at a remarkable rate. Some of these children have developed excessively. In considering the value of the various factors which enter into a study of the diabetic child, the relation of insulin and diet therapy must be given important consideration.

DR. NORMAN M. KEITH, Rochester, Minn.: Dr. Wilder has had about ten cases of juvenile diabetes similar to those mentioned by Dr. Bartlett. These cases were followed for a period of two years, and he concludes from this small series that from 0.66 to 2.0 Gm. of protein per kilogram of body weight is sufficient for adequate growth when the caloric requirements are also adequate. His impression is that it is probably advisable to use 1.5 Gm. per kilogram when the protein is made up of the complete type of protein. One word more in regard to the treatment of nephritis cases which are on the borderline of nitrogen retention. In such cases it is necessary to keep the protein in the diet below a certain level. We have found that we can keep patients on 0.66 Gm. protein per kilogram for months at a time if the caloric requirement is adequate.

DR. WALTER M. BARTLETT, Boston: I was very glad to hear Dr. Williams refer to insulin in relation to growth, because that necessarily is an important question. Patients we have had who did not require insulin have shown as rapid a growth as those who required insulin, as soon as their caloric intake reached their requirement. I think it is entirely a question of maintaining a normal blood sugar and, therefore, I think the patient with a mild case will grow without insulin, but the severely ill patient certainly will not grow unless insulin is used. With reference to the cases mentioned by Dr. Keith, his results have confirmed the fact that the protein requirement, as estimated by Holt, is at least 100 per cent too high. A series of cases has been studied by Dr. Palmer of the Presbyterian Hospital, New York; he has found the protein requirement in children never to exceed 1 Gm. protein per kilogram of body weight. He has thus confirmed the results which I have reported.

THE EFFECT OF VARIOUS SUPPLEMENTARY LUNCHES ON THE PLASMA CARBON DIOXIDE CAPACITY OF CHILDREN *

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The experiment here described was conducted in connection with other nutrition studies on a group of malnourished children, residents of the California State School for Deaf and Blind at Berkeley. The work was designed to supplement other studies on the comparative effects of certain supplementary lunches in the treatment of undernourished children. The subjects were given a medical examination at the beginning and end of the study; weight, height, hemoglobin, alveolar carbon dioxide tension, vital capacity, chest circumference, chest expansion and hand-grip strength were taken at the beginning and end and at intervals throughout the feeding period, which lasted for eighteen weeks. All the children had the same basal diet, the usual meals served in the dining room of the institution. A record of the menus was kept, and notes were made as to the appetite of the subjects of this study.

The supplementary lunches were given at the same time each morning under supervision of a nurse. One-half pint of whole milk, one medium sized sweet navel orange, and four average-sized pulled figs (about 2.5 oz.), respectively, made up the lunches used. This extra feeding was begun on Jan. 12, 1925, and was continued till May 28.

ACIDOSIS IN CHILDREN

Although much work has been done in the study of acidosis and low alkaline reserve values in adults, particularly with reference to disease and to varying barometric pressures, and some study has been made of acidosis in infants, up to the present time very few determinations have been made with reference to acidosis in children. Indeed, while Van Slyke and his co-workers [1] state that the carbon dioxide carrying capacity of the plasma in normal resting adults ranges from 53 to 80 per cent at ordinary altitudes, no one as yet has determined the corresponding normal range for children. Schloss and Stetson,[2] in their study of

* Received for publication, June 14, 1926.
* From the Laboratory of Household Science, the University of California.

1. Van Slyke, D. D.; Stillman, E., and Cullen, G. E.: Studies of Acidosis. V. Alveolar Carbon Dioxide and Plasma Bicarbonate of Normal Men During Digestive Rest and Activity, J. Biol. Chem. **30**:401, 1917.

2. Schloss, O. M., and Stetson, R. E.: The Occurence of Acidosis with Severe Diarrhea, Am. J. Dis. Child. **13**:218 (March) 1917.

the occurrence of acidosis with severe diarrhea, found values ranging from 46.2 to 76.1 per cent in twenty infants not acutely ill with the disease, although they showed minor nutritional disorders such as occasional vomiting, and stools which were of abnormal character or frequency. They were gaining slowly or not at all, and were all underweight. The determinations did not show uniformly low values, but rather a wide variation, with a tendency to be lower than in adults. Howland and Marriott [3] also found acidosis in many cases of diarrhea in children not of the ileocolitis type, with the clinical accompaniment of hyperpnea. They confirmed the presence of acidosis by determining the lowering of carbon dioxide tension of the alveolar air, the increase in the hydrogen ion concentration of the serum, and the diminution of the combining power of the hemoglobin for oxygen. The acidosis did not seem to be due to the presence of acetone bodies, nor to a loss of base, and they thought it probably due to the difficult excretion of acid phosphate by the kidneys.

The appearance of the "acetone bodies," that is, acetone, aceto-acetic acid and beta-hydroxybutyric acid in the urine in appreciable quantity was originally taken as an index of acidosis, and the extent of the acidosis was judged by the estimation of the amount of these bodies present in the urine. That this is not a reliable index is shown by the occasional observation of a pronounced acidosis with no appreciable increase in urinary acetone bodies. Howland and Marriott,[4] in a later article, conclude that under ordinary circumstances acids that are formed in the body or introduced with the food are neutralized and excreted by the kidneys. If a moderate amount of acid, such as aceto-acetic or beta-oxybutyric, is formed, it is neutralized and excreted with no important loss of base, and there is nothing to indicate an excess of acid formation but the analysis of the urine. There is acetonuria but no acidosis. If the acid is ingested or formed in too great excess, the bases of the body are withdrawn, and the alkali reserve is diminished. There may be acidosis, but no acetonuria unless the acids are those of the acetone series. Moore [5] examined the blood of sixteen normal children after forty-eight hours of voluntary starvation for acetone bodies, and found them to contain 39.5 mg. acetone bodies per hundred grams of blood. Before starvation, the same bloods varied from 1 to 13 mg. per hundred grams, with an average of 6.3 mg. He concludes, however, with Howland and Marriott, that many cases of acidosis in infancy and childhood are not accompanied by an increase of acetone bodies in the blood. Veeder

3. Howland, J., and Marriot, W. M.: Acidosis Occurring with Diarrhea, Am. J. Dis. Child. **11**:309 (May) 1916.

4. Howland, J., and Marriott, W. M.: Acetone Body Production in Infancy and Childhood, Am. J. Dis. Child. **12**:459 (Nov.) 1916.

5. Moore, F.: Acetone Bodies in the Blood of Children, Am. J. Dis. Child. **12**:244 (Sept.) 1916.

and Johnston [6] also conclude that acidosis in infancy and childhood is not due to a production of acetone bodies, and that deficient food or increased requirement for food is the chief cause of acetonuria. They do not believe that this results in acidosis.

A number of determinations of the alkaline reserve of blood plasma of ten boys, aged from 4 to 8 years, were made by Sawyer, Stevens and Baumann.[7] These were all made on before breakfast samples and on three different diets. On "normal mixed" diet they found values ranging from 49 to 69 per cent, with an average for the ten of 54. On low calorie diet, representing partial starvation, the range was from 31 to 57 per cent, and on a high fat diet from 20 to 49.

Schloss and Harrington [8] made determinations on normal infants and obtained a range of 49 to 72, figures which resemble closely those found on normal diet for the older boys studied by Sawyer, Stevens and Baumann. Schloss and Harrington noted the effect of change in diet on the plasma alkaline reserve of two of their subjects. On milk diets the figures were 57.6, 56.7, 58.6 and 58.4. When potato gruel was added to these diets, the percentage figures increased to 63.7, 59.3 and 61.4.

THE RELATION OF DIET TO ALKALINE RESERVE OF THE BLOOD

There has been considerable discussion as to the effect of acid and base forming foods on the reaction of the urine, and on the carbon dioxide tension of the alveolar air and the carbon dioxide combining power of the plasma. It was demonstrated by Sherman and Gettler [9] that vegetables and fruits, on burning, leave an ash in which the basic elements (sodium, potassium, calcium and magnesium) predominate, whereas cereals, meat, eggs and fish leave an ash in which the acid-forming elements (chlorine, sulphur and phosphorus) predominate. Milk shows a slight predominance of basic forming elements equivalent to 2.37 cc. of normal base per hundred grams. Oranges show a greater value than milk, 5.61 cc. of normal base per hundred grams while dried figs are highly basic, being equivalent to 97 cc. of normal base per

6. Veeder, B. S., and Johnston, M. R.: The Factor of Inanition in the Development of Acetonuria in Children, Am. J. Dis. Child. **11**:291 (April) 1916; **13**:89 (Jan.), 1917.

7. Sawyer, M.: Stevens, F. A., and Baumann, L.: Studies of Acid Production. I. The Varying Susceptibility of Children to Acidosis, Am. J. Dis. Child. **15**:1 (Jan.) 1918.

8. Schloss, O. M., and Harrington, H.: Comparison of the Carbon Dioxide Tension of the Alveolar Air and the Hydrogen Ion Concentration of the Urine with the Bicarbonate of the Blood Plasma, Am. J. Dis. Child. **17**:85 (Feb.) 1919.

9. Sherman, H. C., and Gettler, A. O.: The Balance of Acid-Forming and Base-Forming Elements in Foods, and Its Relation to Ammonia Metabolism, J. Biol. Chem. **11**:323, 1912.

hundred grams. Blatherwick [10] confirmed the work of Sherman and Gettler and showed that plums, prunes and cranberries, although yielding a basic ash, nevertheless increase the acid formation. He explained this by the fact that the latter foods contain benzoic acid, which increases the acidity owing to the formation of hippuric acid. In a study of the effect of a basic forming food on the carbon dioxide tension, using the Haldane method, he showed that one subject had a carbon dioxide tension of 34 mm., with a p_H of 5.30 on a prune diet. Under the influence of cantaloups, a basic forming food containing base equal to 7.47 cc. normal solution per hundred grams, the carbon dioxide tension increased to a maximum of 38.2 mm., and the p_H decreased to 7.38. On returning to the acid diet, a drop in carbon dioxide tension was observed. Hasselbalch [11] has reported similar changes brought about by variation in diet. The values for carbon dioxide tension obtained with one of this author's subjects were as follows: meat diet, 37.8 mm.; mixed diet, 38.3 mm.; vegetarian diet, 43.3 mm.; and alkaline diet (administration of sodium bicarbonate), 42.1 mm. McClendon, von Meysenbug, Engstrand and King [12] disagree with this view. From their work they concluded that the alkaline reserve of man and dog is remarkably resistant to the influence of diet, whereas the rabbit is susceptible to the effects of diet and fasting. They believe that the inadequacy of acid-forming diets is due to a deficiency in antiscorbutic substances. Forbes, Halverson and Schulz,[13] in work on swine, concluded that the alkali reserve of the blood plasma of swine may be significantly raised by the feeding of potentially basic precipitated calcium carbonate, or decreased by the feeding of potentially acid precipitated calcium phosphate when these substances are fed as supplements to a cereal ration in quantities such as might be used in practical feeding. Blatherwick and Long [14] studied the effects of drinking large amounts of orange juice on urinary acidity and the plasma carbon dioxide capacity. They found a marked increase in the p_H value, an increased excretion of organic acids and a marked decrease in ammonia output. One subject gave an increase from 59.5 cc. carbon dioxide capacity before the orange juice period to 63.3 cc. at the close.

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10. Blatherwick, N. R.: The Specific Rôle of Foods in Relation to the Composition of the Urine, Arch. Int. Med. **14**:409 (Sept.) 1914.

11. Hasselbalch, K. A.: Neutralitätsregulation und Reizbarkeit des atemzentrums in ihren Wirkungen auf die Kohlensäurespannung des Blutes, Biochem. Ztschr. **46**:403, 1912.

12. McClendon, J. F.; von Meysenbug, L.; Engstrand, O. J., and King, F.: Effect of Diet on the Alkaline Reserve of the Blood, J. Biol. Chem. **38**:539, 1919.

13. Forbes, H. E.; Halverson, J. O., and Schulz, J. A.: Alkali Reserve of Swine as Affected by Cereal Feeding and Mineral Supplements, J. Biol. Chem. **42**:459, 1920.

14. Blatherwick, N. R., and Long, M. L.: Studies of Urinary Acidity. I. Some Effects of Drinking Large Amounts of Orange Juice and Sour Milk, J. Biol. Chem. **53**:103, 1922.

Another time, on drinking 800 cc. orange juice, determination of the plasma values gave 63.3 cc. carbon dioxide before the ingestion and 67.2 cc. one hour afterward.

METHOD OF EXPERIMENT

The object of this study was to compare the effects of various supplementary lunches—milk, oranges and figs—in overcoming malnutrition and underweight in poorly developed children, as well as to discover, if possible, the physical conditions which accompany persistent underweight in children. It was early noticed that there might be a correlation between underweight and failure to gain and low alkaline reserve. A group of twelve children, nine girls and three boys, who gave low alveolar carbon dioxide values by the Marriott clinical method, were selected. They varied from 17.6 underweight to 33.3 overweight as is shown in table 1. The tables of Baldwin and Wood [15] were used to determine the percentage over or underweight.

TABLE 1.—*Nutritional State of Children Used in Acidosis Study*

			State of Weight				Actual Gain in 18 Wks., Lbs.	Ex-pected Gain, Lbs.	Gain, per Cent Above or Below Expected	Supple-mentary Lunch	Defect	Alveolar Air Carbon Dioxide Tension, Mm. Hg†
			Beginning		End							
No.	Sex*	Age, Yrs.	Lbs.	Per Cent Normal	Lbs.	Per Cent Normal						
1	♀	9	34.0	—10.4	35.5	—14.4	1.5	2.0	— 25.0	Milk	Blind	25 - 30
2	♀	7	43.5	+ 6.1	43.0	+ 3.6	—0.5	1.75	—131.4	Milk	Blind	30
3	♂	7	48.5	+ 7.7	49.5	+10.0	1.0	1.75	— 42.8	Orange	Deaf	25 - 30
4	♂	14	85.5	— 5.0	95.0	+ 3.2	9.5	4.5	+211.1	Orange	Deaf	25 - 30
5	♀	10	56.5	—11.7	58.5	— 8.6	1.75	2.0	— 12.5	Orange	Deaf	25 - 30
6	♀	12	54.5	—13.5	57.75	— 8.3	3.25	3.25	± 0.0	Orange	Deaf	25 - 30
7	♀	7	28.0	—17.6	28.5	—19.7	0.5	1.75	— 71.4	Orange	Deaf	25 - 30
8	♀	10	65.5	— 3.5	57.5	— 4.1	2.0	2.0	± 0.0	Orange	Deaf	25 - 35
9	♀	9	55.0	+ 5.7	55.5	+ 2.8	0.25	2.0	— 87.5	Orange	Deaf	25 - 30
10	♀	10	62.5	+ 7.7	64.5	+ 9.3	1.0	2.0	— 50.0	Orange	Deaf	25 - 30
11	♀	9	58.5	+ 6.4	65.0	+13.9	6.5	2.0	+325.0	Figs	Deaf	35 - 40
12	♂	10	84.0	+33.3	90.5	+43.6	6.5	2.0	+325.0	None	Blind	25 - 35

* In this column, and in table 3, ♀ indicates female; ♂, male.
† Four determinations at month intervals.

All of the twelve children gave approximately the same low alveolar carbon dioxide value and this was the only basis on which their selection was made. Obviously, it would have been better to have made a more even distribution of the group on the basis of the food used as a supplementary lunch, but all of the children were a part of other groups whose weight curves were being studied, and it was thought best not to disturb the former arrangement. They were kept on the original supplementary lunch until the other work was completed. It is to be noted that there is quite a wide range in the difference of their state of nutrition. Two of the subjects, 1 and 7, were perniciously underweight; four of them, 5, 6, 4 and 8, were in a poor state of nutrition, and five,

15. Baldwin, B. T., and Wood, T. D.: Mother and Child, Am. Child. Health Assoc., July Supl., Washington, D. C., 1923.

2, 9, 11, 3 and 10, were of approximately normal weight. Casual observation showed that none of the latter five children were overweight, and they served as controls in the nutrition studies. Most authorities now do not consider a child to be overweight unless he is more than 7 per cent overweight, and all agree that it is much less serious to be a few pounds overweight than underweight. The last subject, 12, was distinctly overweight, a phlegmatic, dull heavy individual, who was an interesting subject for several types of experiments.

The first blood samples were collected at the same time that the Wassermann and Schick tests were being made for the school. Later, permission was given to take blood samples with the aid of Dr. Rexford Hoobler for the acidosis studies alone. The children were kept on the original lunch until the nutrition studies were finished, then some of the lunches were changed in order to compare to some extent the effect of different foods on the alkaline reserve of the same persons.

The method used was that of Van Slyke and Cullen [16] for determining the carbon dioxide capacity of the plasma.

DRAWING THE BLOOD SAMPLE

The blood samples were drawn by Dr. R. Hoobler at the hospital of the school. The children were kept as quiet as possible before the blood was drawn, all muscular exertion was avoided, as this, presumably because of the lactic acid formed, lowers the bicarbonate of the blood (Christiansen, Douglas and Haldane [17]). Except in one case in which it was difficult to keep the subject from being a little frightened, they sat very quietly around the room during the preliminary period. The blood was drawn from the arm vein with a minimum amount of stasis directly into a heavily oiled syringe. The blood was then immediately transferred under oil to a centrifuge tube containing a little powdered potassium oxalate and some paraffin oil. The tube was subjected to a minimum amount of agitation, and the oxalate was stirred through the mixture with a small glass rod. Usually four 10 cc. blood samples from four subjects were taken at a time. Each centrifuge tube was carefully marked with the child's number, then all four were centrifuged for one-half hour to separate the plasma from the corpuscles, to prevent electrolytic transfer from cells to plasma and a consequent lowering of the alkaline reserve value. The period of time elapsing between the drawing of all four blood samples and centrifuging never was greater than fifteen minutes. After the samples were centrifuged, the plasma was immediately pipetted off from the corpuscles, and transferred to a

16. Van Slyke, D. D., and Cullen, G. E.: Studies of Acidosis. I. The Bicarbonate Concentration of the Blood Plasma; Its Significance, and Its Determination as a Measure of Acidosis, J. Biol. Chem. **30**:289, 1917.

17. Christiansen, J.; Douglas, C. G., and Haldane, J. S.: The Absorption and Dissociation of Carbon Dioxide by Human Blood, J. Physiol. **48**:246, 1914.

second tube also containing oil. These tubes were carefully stoppered with cotton, and all four samples were transferred with a minimum amount of agitation to the household science laboratory of the University, where the analysis was completed at once. All determinations were made in duplicate, and only practically identical checks were accepted.

MEDICAL RECORDS OF THE SUBJECTS USED IN THE ACIDOSIS STUDIES

Table 2 gives a summary of the information furnished about each subject involved in the experiments, from the medical records of the institution. Obviously the physical condition and the physical heritage of each child has much to do with his or her ability to gain, and for this reason the group studied could hardly be called a normal group, since most of them have minor defects, and five out of the group have

TABLE 2.—*Summary of Physical Condition of Subjects*

Number	Teeth	Adenoids	Tonsils	Condition as to Serious Defect	Summary	Gain, per Cent Over or Below Expected
1	9	8.5	7	B	8.16 B	— 71.4
2	7	8	7	B	7.3 B	± 0.0
3	8	8	7	B	7.66 B	— 12.5
4	9	8.5	9	A	8.83 A	— 0.0
5	8	8.5	9	A	8.5 A	+211.1
6	8	7	9	A	8.0 A	± 0.0
7	7	8.5	7	A	7.5 A	−131.4
8	7	9	9	A	8.66 A	— 87.5
9	8	7	9	A	8.0 A	+325.0
10	8	8.5	8	B	8.16 B	— 42.8
11	8	7	9	A	8.0 A	— 50.0
12	8	9	9	B	8.66 B	+325.0

Key: 9, condition good; 8.5 condition of adenoids not remarkable; 8, condition fair; 7, condition poor; A, subject has no serious defects; B, subject has serious defects.

serious defects, such as heart trouble or glandular disturbances. Before the end of the study it was decided quite definitely that these children could not be compared with the group used by Chaney [18] of this laboratory in a comparison of oranges and milk as supplementary lunch, because their general health was poorer than that of the average school group, and because their physical defects prevented them from making normal gains. The medical records indicate that not only is the blindness and deafness usually congenital, but that the general inherited physical constitutions of such children is on a lower plane than that of normal school children.

RESULTS OF CARBON DIOXIDE CAPACITY TESTS

Table 3 is a summary of all the data obtained in the acidosis studies. So far as possible, we tried to obtain three determinations for each

18. Chaney, M. S.: A Comparison of the Value of Milk and Oranges as Supplementary Lunch for Underweight Children, Am. J. Dis. Child. **26**:337 (Oct.) 1923.

TABLE 3.—*Relation of Carbon Dioxide Capacity of Plasma to Nature of Supplementary Lunch Fed to Undernourished and Normal Children*

No.	Sex	State of Nutrition (at Beginning) per Cent Under Age, Years, or Over Normal Weight		Supplementary Lunch		Carbon Dioxide Combining Power of Plasma		New Supplementary Lunch		Carbon Dioxide Combining Power of Plasma			New Supplementary Lunch		Carbon Dioxide Combining Power of Plasma		
				Food	Period Days	Cc. per 100 Cc. of Plasma	Date	Food	Period Days	Date	Per Cent	Increase or Decrease	Food	Period Days	Date	Per Cent	Increase or Decrease
1	♀	9	—10.4	Milk	32	63.15	March 9	.....	..	.....	.....	.....	.....	..	.....	.....	.....
2	♀	7	+ 6.1	Milk	32	65.08	March 9	.....	..	.....	.....	.....	.....	..	.....	.....	.....
3	♂	7	+ 7.7	Orange	66	Sample lost	March 17	Milk	24	May 22	42.30	.....	.....	..	.....	.....	.....
4	♂	14	— 5.0	Orange	63	58.74	April 9	Milk	24	May 22	60.11	+ 1.37	.....	..	.....	.....	.....
5	♀	10	—11.7	Orange	40	51.46	March 17	.....	..	.....	.....	.....	.....	..	.....	.....	.....
6	♀	12	—13.5	Orange	32	44.54	March 9	Orange	50	April 28	55.73	+11.19	Milk	28	May 26	52.73	—3.00
7	♀	7	—17.6	Orange	32	38.64	March 9	.....	..	.....	.....	.....	.....	..	.....	.....	.....
8	♀	10	— 3.5	Orange	40	49.17	March 17	Orange	43	April 28	58.57	+ 9.40	Milk	28	May 26	50.79	—7.78
9	♀	9	+ 5.7	Orange	63	47.08	April 9	Orange	43	May 22	48.81	+ 1.73	.....	..	.....	.....	.....
10	♀	10	+ 7.7	Orange	63	49.12	April 9	Orange	47	May 26	53.79	+ 4.67	.....	..	.....	.....	.....
11	♀	9	+ 6.4	Figs	63	51.35	April 9	Figs	43	May 22	56.85	+ 5.50	.....	..	.....	.....	.....
12	♂	10	+33.3	None	40	47.59	March 17	Orange	43	April 28	55.73	+ 8.14	Orange	28	May 26	53.79	—1.94

subject, but permission could not be obtained in most cases, and if a blood sample were lost in a determination, it was not possible to obtain a duplicate.

The range of values obtained is almost as varied as that of Schloss and Stetson in normal infants, but there seems to be a general tendency for the values to be lower than in adults, particularly in some of the younger children. There also seems to be individual variation about as great as in the normal pulse rate.

As has been stated before, the children were left on the original supplementary lunch for the first fourteen weeks. It was early discovered that the determinations made by the Marriott test were not reliable and often gave incorrect values, particularly in the case of deaf children, from whom it was extremely difficult to obtain cooperation. The Van Slyke method for carbon dioxide capacity of the plasma is, of course, independent of this factor.

COMMENT

There seems to be a certain tendency toward a seasonal increase or decrease in the alkaline reserve of the plasma of these children. Thus, most of the determinations made in April were higher than those made in March, and the three determinations made late in May were lower than corresponding April figures. It is possible that the increase in amount of fresh vegetables and fruits in the diet which takes place during March and April may have some influence in this matter. If the maximum effect was reached in April, the slight falling off in May may result from the possible decrease in consumption of fruits and vegetables as the season advanced.

Normal values for the carbon dioxide combining capacity of the plasma for children of the ages studied would seem to be somewhat lower than in adults. Van Slyke [1] finds values for normal resting adults varying between 80 and 53 per cent. Schloss and Stetson [2] find values between 63 and 46 per cent for infants, although these infants were not making normal weight gains. Our results seem to show that values for normal children up to 12 years of age lie between 65 and 48 per cent.

Apparently low alkaline reserve values, poor nutrition and persistent failure to gain are correlated to some extent. In all except one of our underweight subjects, the values ran from 38.64 to 51.46 per cent. In subjects in whom the normal gain was made, these figures rose from 5 to 12 per cent. Even the normal weight children who failed to gain showed low alkaline reserve figures.

It is difficult to appraise the effect of the milk, oranges and figs on the alkaline reserve of these children. In the one subject given figs, excellent gain in weight and rise in alkaline reserve to a normal figure resulted. Whether these changes were affected by the fig lunch cannot

be estimated. We plan to carry on further work with figs, in which definitely acidotic cases will be studied.

All five subjects fed orange, in which two or more determinations at varying intervals were made, showed increases in alkaline reserve of 4 to 9 per cent. In one case, however, the increase was only 1.73 per cent. A third determination made on number 12, a possibly hypothyroid subject, after seventy-one days on orange lunch showed a decrease in alkaline reserve of 1.94 per cent.

In two out of three subjects changed from orange to milk, a definite decrease in alkaline reserve resulted. The third subject increased 1.37 per cent to 60.11 cc. carbon dioxide capacity from a figure 58.74, which was already probably normal.

The question of the possibly variable character of carbon dioxide combining capacity of blood plasma with a state of digestive activity, and with the acid-base equilibrium of ash of food just ingested, is not yet answered. Van Slyke [1] made a number of determinations on resting adults just before and just after meals, and found variations as high as + 4.8 per cent and — 5.4 per cent. He made no note of the character of the meals, but states that, in general, digestive activity lowers the plasma carbon dioxide capacity. Blatherwick and Long [14] noted variation of + 3.8 and + 3.9 per cent after ingestion of 800 cc., or more, of orange juice. The variations which we observed were larger in some cases at least than these. All blood samples were taken at the same time in the morning, at least two hours after the last meal, with the exception of one or two samples which were taken in the middle of the afternoon. In table 4 the menus for the two meals preceding the blood drawing are given. It is evident that no significant differences in composition of these meals can be deduced. Oranges and figs were served on some of these days and milk at each meal every day.

Although the number of cases studied is small, it is fair to raise the question from these data as to a probable correlation between certain types of undernutrition in children and low alkaline reserve of the blood plasma. Apparently the addition of oranges to the diet stimulates increase in alkaline reserve in these subjects more successfully than does milk.

A rise in alkaline reserve in all our cases is correlated with weight gain in numbers 4, 6, 8, 10, 11, and persistently low alkaline reserve with failure to make the full expected gain in numbers 9 and 10. Of the four underweight children on whom only one plasma alkaline reserve determination was made, numbers 3, 5 and 7 show lower than average values, and one, number 1, shows a relatively high figure. Number 5, although of normal weight according to the table, had all the stigmas of undernutrition.

SUMMARY

1. In connection with other studies on the nutrition of children in the California School for Deaf and Blind, determinations of the carbon dioxide combining capacity of the plasma of twelve children were made. Five of these children were 5 to 17 per cent underweight according to the Baldwin and Wood standard, one was 33 per cent overweight and six were practically normal in weight.

TABLE 4.—*House Diets Fed All Children on Days of Alkaline Reserve Determinations*

Date	Breakfast	Dinner (Noon)
March 9	Orange Oatmeal Scrambled eggs Toast, butter Milk or cocoa	Spanish beef stew Boiled spaghetti Buttered carrots Apricot tapioca and cream Bread, butter Milk
March 17	Stewed figs Corn flakes Creamed chipped beef Rolls, butter Milk or cocoa	Pot roast beef Gravy Steamed potatoes Creamed cauliflower Rice pudding Cream Bread, butter Milk
April 9	Oranges Corn meal mush Scrambled eggs Toast, butter Milk or cocoa	Baked pork and beans Steamed potatoes Creamed cabbage Pie Bread, butter, jelly Milk
April 28	Stewed fruit Oatmeal mush Scrambled eggs Rolls, butter Cocoa or milk	Baked ham and gravy Steamed potatoes Fruit jello Custard sauce Bread Milk
May 22	Oranges Corn flakes Toast, butter Milk or cocoa	Fried fish Creamed potatoes Buttered spinach Canned fruit Bread, butter Milk
May 26	Stewed apricots Oatmeal mush Rolls, butter Milk, coffee	Smothered steak Gravy Steamed potatoes Creamed cabbage Fruit cobbler Bread, milk

2. The six normal weight children showed alkaline reserve figures of 42 to 65 per cent (cubic centimeters carbon dioxide per hundred cubic centimeters plasma). Four out of five underweight children showed corresponding values of 38 to 51.

3. One child who was given figs as a supplementary lunch gained more than three times the expected amount in weight, and showed an increase of 5.5 per cent in carbon dioxide combining power of plasma after a forty-three day interval.

4. Five children who were given oranges as a supplementary lunch. and on whom two or three alkaline reserve determinations were made at twenty-eight to fifty day intervals, showed increases in carbon dioxide

combining power of plasma of 1.7 to 11.19 per cent. Those subjects, numbers 9 and 10, who failed to make the expected gain in weight during these periods also showed the lowest gains in alkaline reserve.

5. Two out of three children who were changed from oranges to milk, after a twenty-eight day interval showed a decrease in alkaline reserve of plasma 3.0 and 7.78 per cent. The third child showed an increase of 1.37 per cent after a forty-three day interval on milk.

6. Whether the alkaline reserve values observed are indicative of a cumulative relatively steady rate of change, or are variable random figures modifiable within a few hours by a change in diet, is a question which can be answered only by day to day observations on several subjects. Such a study on children remains to be done.

EFFECT OF PASSAGE OF STOMACH TUBE ON TITRATABLE ACIDITY AND p_H OF THE GASTRIC CONTENTS *

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GASTRIC ANALYSIS

The importance of gastric analysis is generally recognized. To be sure, there are a few who maintain that by this test nothing can be learned which cannot be obtained more easily and accurately by means of the roentgen ray. This is true for motility and emptying time, but for the diagnosis of achylia gastrica, hyperchlorhydria and other secretory disturbances, gastric analysis is necessary because roentgen-ray observations are of little value in these conditions. In recent years, much work has been done by means of gastric analysis to study the response of the infant's stomach to different types of meals. The importance of this test is further emphasized by the fact that there are no other good methods available for testing gastric secretory function, since the recently suggested gastric test with neutral red has not been found satisfactory. For these reasons, gastric analysis has generally been regarded as an important test in the study of the physiology and pathology of gastric secretion.

The stomach tube has been universally used for obtaining gastric contents for analysis. One might expect to find certain alterations in the gastric contents, due to the gagging and retching which almost invariably occur during the passage of the stomach tube. There is stimulation to the secretion of saliva, which might dilute and neutralize the gastric contents. There is also reflex stimulation of the gastric mucosa, which might result in an outpouring of mucus. The mucus, being alkaline and containing protein, might further neutralize and also "buffer" the gastric contents. Finally, considerable conjecture is present in medical literature concerning the reflex duodenal regurgitation which the passage of the stomach tube might induce, and its effect on the gastric contents. These possibilities gave abundant ground for the inference

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* A brief report of this paper is given in the Proceedings of the Physiological Society of Philadelphia, Am. J. M. Sc. **170**:926, 1925.

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that the passage of the stomach tube would result in an acidity less than that existing before the insertion of the tube.

In order to judge accurately the effect of passage of the stomach tube, one must be able to obtain gastric contents directly from the stomach and also through the esophagus. This requires a subject with a gastrostomy opening and, simultaneously, a patent esophagus. If the collections can be made first through the fistula and then through the esophagus by stomach tube, keeping all other conditions as constant as possible, any difference in acidity can be attributed to the passage of the tube. In animal experimentation this can be accomplished easily after performing a gastrostomy on the animal, but search of the literature has disclosed no such experiments. In human beings this has not been done, probably because there have been very few subjects available who have possessed a gastrostomy opening and a patent esophagus at the same time.

EXPERIMENTAL SUBJECTS

The subjects for this work were patients with esophageal stricture from the clinic of Dr. Chevalier Jackson, to whose chief of clinic, Dr. Gabriel Tucker, we are indebted for cooperation in these studies. These patients were suffering from lye or acid strictures of the esophagus, and had gastrostomies performed for the purpose of feeding and of treatment. By using as a guide a string which the patient had previously swallowed, rubber bougies were passed up from the gastrostomy wound through the esophagus to dilate the strictures. After treatment for a variable length of time, the esophagus becomes literally patent, so that the stomach tubes can be passed as easily as in the normal patient. Here, then, is the ideal experimental subject for these studies.

METHODS

First, routine gastric analyses were performed on alternate days, one day through the fistula and the next day through the esophagus. The fasting contents were removed, an Ewald test meal, with a little Karo Corn Syrup added to sweeten the bread, was eaten by the patient, and the meal was removed at the end of one hour. The specimens obtained were tested for free hydrochloric acid, total acidity, and p_H by the electrometric method.[1] In addition to this, "simple gastrics" were studied on alternate days by the two different routes. The "simple gastric" test consisted of giving the test meal without first removing the fasting contents, the meal being removed after one hour through the fistula or by passage of the stomach tube. These specimens were examined for

1. Clark, W. M.: The Determination of Hydrogen Ions, Baltimore, Williams & Wilkins Co., 1920. Kahn, G., and Stokes, J., Jr.: The Comparison of the Electrometric and Colorimetric Methods for Determination of the p_H of Gastric Contents, J. Biol. Chem. **69**:75, 1926.

free hydrochloric acid, total acidity and p_H. Finally, what may be called the "combined tests" were carried out. In these tests the patient was given the test meal without removing the fasting contents, and at the end of one hour the gastric contents were entirely removed through the fistula. The specimen was thoroughly shaken, a small sample, 15 cc., was put aside, and the rest was returned to the stomach through the fistula. The stomach tube was now passed immediately through the esophagus, and the contents of the stomach were removed. These specimens were also tested for free hydrochloric acid, total acidity and p_H. The fistula specimen was removed through the 18 to 28 F catheter, which was always kept in the gastrostomy wound to keep it from closing. The tube which was passed through the esophagus was an ordinary Rehfuss tube with the bucket removed. To prove that the removal of the contents through the catheter in the gastrostomy wound induced no change in their chemical composition, the following experiment was carried out: The patient was given a test meal, and after one hour the gastric contents were removed through the gastrostomy wound and replaced for as many as ten times through the catheter, each time a small sample being set aside for analysis. The results obtained on the different samples showed no significant change between the first and the last sample.

RESULTS

Five patients were available for study. Their ages were 4, 5, 6, 9 and 43 years, respectively. The data obtained from the different analyses on these patients are given in the table. The first two patients, being ward cases, were available for a great many investigations, while the analyses from the last three, who were dispensary cases, were not quite as numerous. The figures for acidity are expressed in terms of cubic centimeters of tenth normal acid, per hundred cubic centimeters of gastric contents. For the sake of making the comparison easier, the results for the same tests performed through the fistula and through the esophagus are put side by side. The figures given opposite the name of each patient are the averages of all the determinations carried out on that patient. The last row of figures is the total average of all the determinations performed on all the patients; the total number of determinations amounting to over fifty.

From an inspection of the data, it becomes evident at once that all the gastric contents obtained by the stomach tube contain less titratable acidity and have a higher p_H than those obtained through the fistula except for a single instance. It may be concluded, therefore, that the passage of the stomach tube and the presence of the tube in the esophagus and stomach are responsible for the observed decrease in the acidity of the gastric contents. It is further evident from the data that the

fasting contents when obtained through the stomach tube are so totally different from those obtained through the fistula, and are so likely to give results which are not representative of conditions as they exist in the stomach, that their value in gastric studies is open to serious doubt. This has been abundantly confirmed by clinical impression. On the other hand, the "test meal" is more nearly representative of the true state of gastric contents at the time, and should be given the most weight in the study of gastric secretory function.

Comparisons of the Analyses of the Specimens Obtained Through the Fistula and Through the Esophagus by Stomach Tube

		Fasting Contents						Test Meal					
		Fistula			Esophagus			Fistula			Esophagus		
Subject	Age	Free HCl	Total Acidity	p_H	Free HCl	Total Acidity	p_H	Free HCl	Total Acidity	p_H	Free HCl	Total Acidity	p_H
G. G.	5	23	48	2.04	6	24	3.91	28	74	1.73	25	49	1.67
A. R.	4	49	79	1.24	0	11	7.76	18	44	1.56	0	17	4.98
N. T.	6	11	54	2.80	0	16	6.25	4	34	3.31	2	21	4.08
A. L.	9	49	74	1.38	16	40	1.96	32	61	1.57	23	63	1.80
Mc. M.	43	24	63	1.89	8	31	2.17	59	96	1.32	11	35	2.12
Average.....		31	63	1.89	6	24	4.41	28	57	1.90	5	37	2.93

		Simple Gastric						Combined Test					
		Fistula			Esophagus			Fistula			Esophagus		
Subject	Age	Free HCl	Total Acidity	p_H	Free HCl	Total Acidity	p_H	Free HCl	Total Acidity	p_H	Free HCl	Total Acidity	p_H
G. G.	5	26	50	1.69	12	33	2.15	26	63	1.61	19	41	1.74
A. R.	4	..	..	....	..	..	....	6	40	2.62	0	18	3.89
N. T.	6	8	43	2.69	2	17	3.47	5	42	2.89	2	33	3.48
A. L.	9	..	..	....	..	..	....	28	65	1.56	17	45	1.96
Mc. M.	43	..	..	....	..	..	....	44	86	1.43	15	45	2.36
Average.....		17	47	2.19	7	25	2.81	22	39	2.02	11	36	2.65

The figures for the "simple gastric" tests, the "combined tests" and the test meals are similar. In all three, the alterations introduced by the tube are much less pronounced than in the fasting contents. The alterations, however, are sufficient, as in the case of A. R., to warrant great care in making definite statements concerning gastric secretory function.

It has not been proved exactly which parts of the gastro-intestinal tract supply the substances introducing the changes caused by the stomach tube. The absence of bile in all the specimens obtained is evidence against duodenal regurgitation, but the failure to test for trypsin does not permit a more definite statement. Furthermore, it must be remembered that the position of the stomach is partially fixed as a result of the gastrostomy, which state may prevent duodenal regurgitation. The presence of mucus in the specimens obtained through the stomach tube is unquestionable when one compares them with those obtained through the gastrostomy wound, but whether this mucus comes from the saliva or from the secretion of the gastric or esophageal mucosa cannot

be decided from these experiments. At any rate, the opinion has been formed that the factors which introduce the difference between gastric contents obtained through the esophagus and those obtained through the fistula come either from the stomach or from above it, rather than from the duodenum.

Finally, it must be remembered that the patients used for this work were being treated regularly once or twice weekly by retrograde bougie. It may be reasonably expected that, since tubes had been passed regularly and frequently through their esophagi for a period of months, they would have developed a minimum amount of reaction to this procedure, and that if these experiments could be repeated on patients without this adaptation, the differences obtained would be even more striking.

SUMMARY AND CONCLUSIONS

Gastric contents were obtained through the esophagus by means of a stomach tube, and through a gastric fistula in the same subject.

The effect on gastric acidity of the passage of the stomach tube has been determined by repeated tests on five such subjects who have gastrostomy wounds as well as patent esophagi. A marked decrease of titratable acidity and a higher p_H of gastric contents have been found due to passage of the tube, an alteration most marked in the fasting contents.

From these studies, it would seem advisable to place little reliance on the results obtained from the fasting contents. The test meal has proved more satisfactory.

The best results can be obtained when the tube is allowed to remain in the esophagus for one hour, the products of its passage having been removed immediately after its insertion, and the patient having been kept as comfortable as possible. Even under such circumstances, only moderate reliance can be placed on the determinations made for titratable acidity and p_H of the gastric contents.

NARCOLEPSY—A SYMPTOM COMPLEX

REPORT OF A CASE IN A CHILD *

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There are two symptoms which characterize narcolepsy: (1) The patient has a tendency to go to sleep at frequent intervals through the day, the attacks of drowsiness often coming on at most inopportune times (while talking, walking, working or eating) and the desire to sleep being irrepressible; (2) the patient may find that any emotion causes a feeling of generalized weakness, so that his knees may give way under him and allow him to fall (the kataplektische Hemmung of Henneberg,[1] the Lachschlag of Oppenheim,[2] the affektiver Tonusverlust of Redlich [3]). Perrier [4] described one patient, a soldier, who went to sleep on guard, and Spiller [5] tells of one of his patients, a fireman on a locomotive, who went to sleep while holding on to the grabirons of a train said to be moving at a speed of about 70 miles an hour. The sleep of a narcoleptic attack resembles normal sleep in all respects. There is no relation between the number of attacks during the day and the amount of sleep which the patient gets at night. The sleep is sometimes disturbed by dreams, many of the dreams being of an hallucinatory type. In Fischer's case the dreams were so vivid as regularly to awaken the patient. The attacks are quite different from epilepsy in that none of the frequently associated symptoms are present (tongue-biting, loss of urine or feces, frothing at the mouth or myoclonic movements); the patient is able to fight off the attack for a time, even though he ultimately succumbs; he can usually be aroused without difficulty, and when the attack is over he is fully aware of having been asleep. The emotional attacks of weakness are brought on most frequently by laughter, but may follow any emotional disturbance. Gélineau described an attack in his patient which came on

* Received for publication, June 30, 1926.

* From the Harriet Lane Home, Johns Hopkins Hospital, and the Department of Pediatrics, Johns Hopkins University.

1. Henneberg, R.: Ueber genuine Narkolepsie, Neurol. Centralbl. **35**:282-290, 1916.

2. Oppenheim, H.: Ueber Lachschlag, Monatschr. f. Psychiat. u. Neurol **11**: 242-247, 1902.

3. Redlich, E.: Ueber Narkolepsie, Ztschr. f. d. ges. Neurol. u. Psychiat. **95**: 256-270, 1925.

4. Perrier, S.: Les narcolepsies postencephalitiques, Rev. Neurol. **1**:1056-1058, 1925.

5. Spiller, W. G.: Narcolepsy Occasionally a Postencephalitic Syndrome, J. A. M. A. **86**:673-674 (March 6) 1926.

during a game of cards. On seeing an unexpected good play he became so weak that he could not move his arm. In one of the cases reported by Spiller, even such a casual event as unexpectedly meeting a friend on the street would cause the patient to become weak, and sometimes he would fall. The term "emotional asthenia" will be used in this paper to designate attacks of this type.

Narcolepsy has generally been considered a disease occurring about the time of puberty or during adult life. In his recent review, Redlich collected thirty-five cases. In twenty-two, the symptoms began between the ages of 10 and 20 years; in three, between 20 and 30 years; in seven, between 30 and 40 years, and in one case the age of onset was uncertain. The occurrence of a typical case in a child aged 7 years may, therefore, be of special interest to pediatricians.

CASE HISTORY

E. S., colored, aged 8 years, was admitted to the hospital April 12, 1926. The history was obtained from the patient's mother.

Family History.—The patient's father and mother are both living and well. The patient is the second of six children. An older sister, three younger brothers and one younger sister are well. No member of the family has suffered from the condition of which the patient complains.

Past History.—The patient was born at term by spontaneous labor. She was breast fed throughout infancy and was considered a normal baby. She learned to walk at 11 months and to talk between the ages of 1 and 2 years. She started to school at the age of 6 years, but was not promoted at the end of the school year, partly because she was slow in understanding her studies and partly because she lost time due to illness. (This information was obtained from the child's teacher at school.) The patient suffered from measles, mumps and varicella between the ages of 3 and 4 years, and from pertussis when 6½ years old. She has had no illness in any way suggesting an attack of encephalitis. She has had rather frequent nosebleeds.

Present Illness.—Complaint: "Sleeps too much." The present illness began in July, 1925, when the patient was 7 years of age. After a severe nosebleed, caused by striking her face against a piece of iron, the patient told her mother she was going to take a nap every day and get fat. Since this time she has shown an extraordinary inclination to go to sleep at all times and in all places. She will be playing with the other children, rest for a few minutes, and then fail to enter into the play because she has fallen asleep. Frequently she has gone to sleep while eating a meal. When she returned to school in the autumn of 1925, she could not continue because she was unable to remain awake in the classroom. She went to bed at 7 every night and arose at 6 the following morning, but her tendency to drop off to sleep was not relieved by the night's rest. She might be asleep again an hour after getting up. At the time of admission her condition had not improved; if anything, she was sleeping more than formerly.

About a month after the onset of her attacks of drowsiness, the mother noticed that at times when the child became excited in her play and started to run she would suddenly tremble, become weak all over, and fall to the ground. On other occasions when laughing hard she would suffer from similar attacks of weakness. Several times these spells were brought on by fright. The most severe attacks were brought on when the patient was tickled. She has never felt weak when crying. She has been having these spells once or twice every day. After an attack she remained weak for five or ten minutes, and fell asleep following most of the spells. If picked up at once she would fall again. She preferred to slump down in a chair.

Prior to the onset of the present illness, the child did not dream more than other children, and the mother remembers nothing about her early dreams. Since the present illness began, her dreams have been bizarre and of an hallucinatory type. The patient frequently saw cats, dogs, horses, pigeons and birds in her room and exclaimed about them. On one occasion she saw an angel in the room. As she talked aloud about the things she saw, the mother sometimes did not know whether or not she was asleep. On the night before coming to the hospital she cried out frequently, "Daddy, put that ole cat out," although there was no cat in the house. The tendency to dream has been much less pronounced during the last month than earlier.

At no time has the patient had any attack suggestive of epilepsy. She has never bitten her tongue, frothed at the mouth, or passed urine or feces either during an attack of weakness or when asleep.

Physical Examination.—Temperature, 98.6 F.; pulse, awake, 80; asleep, 74; respiration, awake, 19; asleep, 18; height, 49½ inches; weight 58 pounds 8 ounces (26.4 Kg.).

There was nothing noteworthy about the patient's general appearance except her tendency to fall asleep whenever left alone for a few minutes. When brought to the dispensary on the morning of admission, she remained on the waiting bench about five minutes before the physician appeared. During this short space of time she had thrown her head back and fallen soundly asleep with her mouth hanging open. She was awakened, taken into one of the examining rooms, and while her mother was being questioned about her illness she again fell asleep. She was wakened, undressed, and while the physician was dictating a note about her appearance she again went to sleep. The sleep as observed was normal and undisturbed. She did not arouse when spoken to quietly but awakened quickly when called in a sharp voice. Immediately afterward she went to sleep again.

Her skin was the dark chocolate color of the pure negro and, except for several scars over the shins, was entirely normal. The color of her lips, conjunctivae and finger nails was normal. There was no enlargement of the superficial lymph nodes. Her head was of normal conformation and measured 20 inches in circumference (occipitofrontal). Macewen's sign was negative. Her vision seemed normal. The pupils reacted actively to light and the extra-ocular movements were well performed. The result of ophthalmoscopic examination was negative. Her hearing was normal, according to the watch test. Otoscopic examination revealed normal drums. There was a slight nasal obstruction from mucus; also marked caries of all the molar teeth, but the others were in good condition. The tonsils were small and normal in appearance. The thyroid gland was not enlarged. The voice was normal. There was no abnormality of the heart or lungs. The abdomen was normal in contour. There was no enlargement of the liver or spleen. The genitals were of normal female configuration; pubic hair was not present. On neurologic examination, no abnormality was detected. The cranial nerves all gave normal responses. Muscular power in the arms and legs was normal. There was no sensory disturbance (tested with sharp and dull). Tests for muscle coordination were well performed (finger to finger, finger to nose, and heel to shin tests). There was no ataxia. The knee jerks and ankle jerks could be elicited but were somewhat sluggish. The biceps and periosteal-radial reflexes were present and equal. The triceps reflex could not be elicited; the abdominals were active. Plantar stimulation caused plantar flexion. Kernig's sign was negative.

Laboratory Examination.—Basal metabolic rate, 18 per cent below normal; hemoglobin (Sahli), 85 per cent; white blood cells, 5,100 (58 per cent polymorphonuclears; 2 per cent polymorphonuclear eosinophils; 32 per cent lymphocytes; 8 per cent large mononuclear and transitional); Wassermann reaction (blood), negative; tuberculin reaction (intradermal 0.1 mg.), negative; urine, normal; stool, no ova; lumbar puncture showed the spinal fluid was clear, colorless, and under normal pressure; globulin (Pandy), negative; five cells; Wassermann reaction, negative; colloidal mastic test, negative; blood nonprotein nitrogen, 33 mg. per hundred

cubic centimeters; blood carbon dioxide, 68.4 per cent by volume; blood sugar, 0.087 per cent (after fast of seventeen hours); blood calcium, 9.9 mg. per hundred cubic centimeters; blood phosphorus, 6.0 mg. per hundred cubic centimeters.

Psychiatric Examination (Dr. Esther L. Richards).—"The only objective evidence of unusual behavior is the tendency to go to sleep when the patient is not stimulated by someone talking to her. She went to sleep three or four times on the bench while waiting for us the first time she came here. There is a great deal of childish wriggling, pulling at the stockings and putting her dress in her mouth, etc., when one is talking to her, but I am inclined to think that this is embarrassment. She complains very little of hallucinations, but does admit that she sees dogs and cats in her room at night. No evidence of fear is expressed when she speaks of these things. During the Binet Simon test, the child responded very well, and I do not feel that any behavior difficulty interfered with the performance. Her Binet Simon test, however, shows typical scattering. Instead of dropping off abruptly as the retarded child does at some point below her physical age, this child scatters through the six, seven and eight year groups doing three or four of the six requirements out of each group. This is to be interpreted as the performance not of a mentally retarded child but of a child whose mental state is in some way disorganized. One sees it in the postencephalitic cases both in adults and in children, and one sees it also in formulated psychotic states. It is an evidence of mental instability, but not necessarily of a formulated psychosis as in this child."

Course in Hospital (before administration of thyroid extract).—During the patient's stay in the hospital, her behavior was not abnormal except as has been noted. Much of the time was passed in sleep. On one occasion when asked why she had been brought to the hospital, she started to reply in a normal voice, then her voice became lower, she stuttered a few times, her head dropped forward, and the voice ceased because she had fallen asleep. At another time the ward nurse observed her suddenly rouse up in her sleep, assert that there was a dog under her bed, and proceed to whip at the imaginary animal with a strap which had been lying on her bed. This continued for about a minute until the nurse shook and awakened her, after which she behaved normally. She remembered her dream perfectly. The attacks of emotional asthenia were not observed in the hospital.

Course in Hospital (after administration of thyroid extract).—On April 28, after an observation period of two weeks, the administration of thyroid extract was begun with a dose of 2 grains daily. As this quantity was well tolerated, the amount was increased in three days to 4 grains daily, and this dose was continued until the time of discharge on May 19. During the first week of thyroid medication, little change was noted in the patient's condition, but after this time she became progressively less drowsy and apparently more alert when awake, so that, except on one occasion, for a week prior to discharge she did not sleep more than a normal child. On this occasion (May 13) the patient was discovered asleep at breakfast time with her meal only partly eaten and a piece of unchewed bread in her mouth. The nocturnal sleep also became less deep, and the night nurse found it difficult to make her routine rounds without arousing the patient. With the amount of thyroid given there was no undue nervousness or other evidence of thyroid intoxication. The basal metabolic rate which had previously been 18 per cent below normal was again determined on May 9 and found to be 1 per cent above normal. There was also a distinct rise in the pulse and respiratory rates—the average pulse rate for the period being 96 when awake and 90 when asleep, and the respiratory rate 23 and 22 awake and asleep, respectively.

STUDIES ON ELECTRICAL CONDUCTIVITY OF SKIN

The recent work of Richter [6] in the Henry Phipps Psychiatric Clinic has suggested that the electrical resistance of the skin, as measured with

6. Richter, C. P.: The Significance of Changes in the Electrical Resistance of the Body During Sleep, Proc. Nat. Acad. S. **12:** (March) 1926.

the string galvanometer and an electrode in the palm of each hand, furnishes an objective method for estimating the depth of sleep. A normal subject with a resistance of 50,000 ohms when awake may show a rapid rise to 500,000 ohms or more on going to sleep. Through the kindness of Dr. Richter, the electrical resistance of the skin in the patient referred to in this paper was recorded at regular intervals throughout her stay in the hospital. As the results of this investigation are to be reported elsewhere in connection with similar studies of other types of disease, a detailed report of the observations will not be given here. Suffice it is to say that the patient's palm to palm resistance even when awake was very high—for the most part about 400,000 ohms—a resistance not recorded with other patients except during sleep.

COMMENT

Narcolepsy was first clearly described by Gélineau [7] in 1880. Two case reports had appeared in the literature a short time prior to this, one by Westphal,[8] in 1877, and the other by Fischer,[9] in 1878; and Gélineau gave an abstract of a case reported by Caffe in 1862. Since this time there has been much dispute concerning the entity of the condition. Many of the case reports which have appeared in the literature have undoubtedly described patients suffering from hysteria or epilepsy, and it is not to be wondered that many clinicians refused to recognize the existence of such a disease. The issue was further confused by Friedmann's [10] description of a group of children with petit mal attacks which disappeared at the age of puberty (called "pyknolepsy" by Stöcker [11] in 1913)—a condition which he said was closely related to Gélineau's narcolepsy. Fortunately, the contributions of Löwenfeld,[12] Redlich,[6] and others have helped to clarify the issue. These authors have emphasized the importance of attacks of emotional asthenia in arriving at a diagnosis. In only twenty-seven of the thirty-five cases collected by Redlich was there any note concerning this symptom. In eighteen of these it was a very outspoken part of the complaint, in six it was slight or atypical in form, and in three it was absent. As disturbances of sleep which may simulate narcolepsy may occur in a variety of conditions—obesity, diabetes, severe circulatory disturbances, brain tumors, encephalitis, epilepsy, hysteria, etc.—

7. Gélineau: De la narcolepsie, Gaz. d. hôp. **53**:626-628 (July 8) 1880.
8. Westphal, C.: Zwei Krankheitsfälle. (II): Arch. f. Psychiat **7**:631-635, 1877.
9. Fischer, F.: Epileptoide Schlafzustände, Arch. f. Psychiat. **8**:200-203, 1878.
10. Friedmann, M.: Zur Auffassung der gehauften kleinen Anfalle, Monatschr. f. Psychiat. u. Neurol. **38**:76-97, 1915.
11. Stöcker, W.: Zur Narkolepsiefrage, Ztschr. f. d. ges. Neurol. u. Psychiat. (orig.) **18**:217-246, 1913.
12. Löwenfeld, L.: Ueber Narkolepsie, München. med. Wchnschr. **49**:1041-1045, 1902.

it seems wise to insist on the occurrence of emotional asthenia for a diagnosis of true narcolepsy. It may prove helpful, as Redlich has suggested, to classify other cases of diurnal sleeping attacks of pathologic character as "symptomatic narcolepsy." It is quite true that in some cases the essential disturbing factor may be the same in the two groups, but it is equally obvious that errors in diagnosis will be more frequent in the symptomatic group. Recently, I have seen an example of this symptomatic narcolepsy in the Harriet Lane dispensary. An abstract of the history is given here.

CASE HISTORY

E. C., a colored boy, aged 12 years, was last examined April 8, 1926. His past history was essentially negative. He learned to walk at the age of 1 year and talked at 2 years. He had measles and pertussis before the age of 3 years. His adenoids were removed in July, 1925.

Present Illness.—Complaint: "Falls asleep all the time." The present illness began in the spring of 1925 (about Easter) when the patient was 11 years old. Prior to this the boy was normal in all respects. He went to bed at 8 p. m. and arose at 6:30 or 7 a. m., and never slept during the day. There was no illness prior to the onset and no history of diplopia. On returning from school one afternoon, the patient went upstairs to change his clothes and fell asleep while doing so. After this he began to fall asleep at frequent intervals during the day—whenever he sat down. He was unable to play such games as hide and seek with the other children, as he went to sleep while waiting for them to hide. On one occasion (July, 1925) he went to sleep while walking down the street with his mother. He did not fall, but his steps gradually slowed and his head drooped forward. The mother had to shake and arouse him before they could go on. As a rule, however, he did not sleep while walking or standing, but he always fell asleep in street cars, in church, etc. In September, 1925, he returned to school, but went only for two days as he could not remain awake. No improvement had been noted following the removal of adenoids.

There was no history of loss of muscle tone from emotion. The patient had never experienced any sensations of weakness while laughing or when frightened.

Physical Examination.—The patient was first examined in the outpatient department of the Harriet Lane Home on Sept. 30, 1925, six months after the onset of his illness. During the time in the dispensary he slept soundly whenever left alone for a few minutes, but when aroused answered questions intelligently and even gave a good description of his own sensations of drowsiness, saying that at times his eyes became very heavy, as if weights were pressing down on them, and that he was totally unable to remain awake even though he tried. There were no abnormal observations on physical examination. The patient was well nourished and well developed, and there were no signs of focal infection in the teeth or tonsils. The thyroid gland was not enlarged. Neurologic examination was entirely negative.

Laboratory Examination.—Wassermann reaction (blood), negative; urine, normal; stool, no ova or parasites were present.

Psychiatric Examination (Dr. Esther L. Richards).—"During examination the child responded satisfactorily. He did all the ten year Binet Simon tests, and three of the twelve year group. This gives him a mental age of about 11 years. For a colored child I consider this is quite satisfactory and showing no evidence of retardation. While on the bench in the dispensary the child nodded several times, but in talking with him one is impressed with normal responsiveness, and absolutely no side tracking of thought or emotional disturbance that could be called pathologic. The neurologic examination is negative."

Course.—Following his first visit to the dispensary, the patient was observed at regular intervals. An attempt was made to improve the diurnal drowsiness by giving the patient more opportunity for regular sleep. He was told to take a nap in the middle of the day and to go to bed earlier and get up later in the morning. At the time of writing he takes a nap at noon—after supper goes to sleep at about 7 p. m., sleeps until 9 p. m., gets up for a short time, goes to bed at 10 p. m., and sleeps until morning (8 a. m.). He has been taking an ordinary bitter tonic containing a small amount of nux vomica. Under this routine he has improved a great deal, and now he rarely falls asleep during the day. He was able to return to school in February and has been making very satisfactory progress. The teacher reports that he has fallen asleep only twice during class hours; that he does become excessively drowsy if the room is warm, but that she can control this by having him go to an open window for fresh air.

On April 24, 1926, the administration of thyróid extract was begun to see if any further improvement could be brought about. The dose was started with 2 grains daily, and on May 1 it was increased to 4 grains. Before the beginning of thyroid medication the pulse rate was 72 and the respiratory rate 20. On May 12, the pulse and respiratory rates were 88 and 21, respectively, but no further symptomatic change had been noted in the patient's condition.

Narcolepsy typically runs a chronic course. Redlich refers to two of his patients in whom the disease had persisted for nineteen and ten years, respectively, and mentions a case reported by Goldflam which had been observed for twenty-one years. Dercum's [13] patient had had symptoms for seventeen years when he came to the hospital for treatment. In some of the cases, however, improvement has been noted under different forms of therapy, but unfortunately most of them have been observed for short periods only and the ultimate outcome is not on record. Two patients have been reported in whom the condition developed as a complication of pregnancy and disappeared with its termination. Redlich expresses the opinion that the prognosis may be better when the narcolepsy appears as a sequel of encephalitis.

In most of the reported cases no mention is made of impaired mentality. However, Redlich states that all of his eleven patients did show some mental change, and that in a few it approached the degree of mild imbecility. In the patient reported here, the Binet Simon test done by Dr. E. L. Richards showed no evidence of mental retardation, but did indicate disorganization of the mental status.

It is interesting that most of the reported cases refer to males of adult age. Of Redlich's thirty-five cases, twenty-eight occurred in men and seven in women. Probably the striking preponderance of cases in males is attributable to the fact that the disease so interferes with the patient's ability to perform his daily work that he seeks a doctor for relief, whereas the average woman engaged in housework, although greatly inconvenienced by the attacks, does not face the situation of loss of employment. It seems likely that the lack of reported cases in children may have a similar explanation.

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13. Dercum: Profound Somnolence or Narcolepsy, J. Nerv. & Ment. Dis. **40**:185-187, 1913.

None of the remedies advocated for narcolepsy have found universal favor. Löwenfeld reported a cure by hypnosis, but the diagnosis in this case is open to question. Soporific drugs, given to deepen the sleep at night, have had no effect in relieving the patient by day. Hydrotherapy has been used without benefit. Caffeine has seemed to help several of the patients, but at best must be purely symptomatic in its action. In 1913, Dercum reported marked improvement in his patient following the administration of thyroid extract. Recently, Wenderowič [14] and Matzdorff [15] have reported patients in whom improvement was noted following the giving of thyroid extract, and the case reported here adds another example to the list. However, in a second patient reported by Wenderowič, in whom the disease developed as a sequel of encephalitis, thyroid medication had no effect. In Stiefler's [16] case of postencephalitic narcolepsy, improvement followed the administration of iodine. Until more information is available, it is obviously impossible to say what form of therapy will prove most beneficial in any given case.

Up to the present time there is no accurate knowledge concerning the etiology of this affection. No necropsies have been performed. In a few of the cases, heredity has been mentioned as a factor; in several, traumatic injury of the skull has been recorded. Gélineau's patient had a history of a blow on the head by a falling piece of wood. In my case the patient's mother definitely dates the onset to a blow on the face which resulted in severe epistaxis. The case reported by MacCormack [17] of a patient who developed narcoleptic attacks immediately after she had had ten teeth extracted at one sitting and without anesthesia, belongs to the symptomatic group. Other factors such as overwork and starvation have been mentioned, but in most of the cases the etiology remains obscure. During the last few years a number of cases have been reported in which the sleep disturbance has followed closely after epidemic encephalitis. This is of especial interest, because of the known frequency with which encephalitis disturbs the normal sleep rhythm so the patient is unable to go to sleep at night and spends much of the day in sleep. Most of the cases which have been so recorded, notably those of Perrier [4] and Kraus,[18] belong to the symptomatic group. However, in the case reported by Stiefler [16] there were

14. Wenderowič, E.: Hypnolepsie ("Narcolepsia Gélineau") und ihre Behandlung, Arch. f. Psychiat. **72**:459-472, 1925.

15. Matzdorff, P.: Ueber Narkolepsie, Deutsche Ztschr. f. Nervenh. **88**:1-13, 1925.

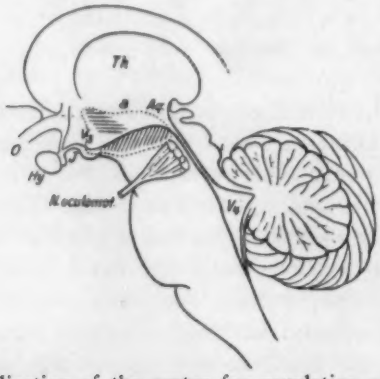
16. Stiefler, G.: Narkolepsie nach Enzephalitis Lethargica, Wien. klin. Wchnschr. **37**:1044-1046 (Oct. 2) 1924.

17. MacCormack, J.: A Case of Narcolepsy, Lancet **2**:565 (Aug. 26) 1899.

18. Kraus, W. M.: Encephalitis Lethargica with Severe Recurrent Narcolepsy, J. Nerv. & Ment. Dis. **53**:124 (Feb.) 1921.

typical attacks of emotional asthenia in association with the narcoleptic attacks, and the history is so complete as to allow no possibility of doubt concerning the nature of the antecedent illness. Wenderowič has recently added an additional case with a definite history of encephalitis followed by true narcolepsy associated with a parkinsonian syndrome.

In reviewing these etiologic factors, and especially the known fact that the condition occasionally follows encephalitis, it is likely that narcolepsy does not represent a disease sui generis, but is rather a syndrome or symptom complex depending on injury of a definite area in the brain. During the last few years, a considerable amount of literature has appeared dealing with a supposed "sleep center" as well as with a center for the control of muscle tone. Recent investigations have disposed of the idea that muscle tonus is dependent on sympathetic



Diagrammatic localization of the center for regulation of sleep (dotted line): *Aq*, aqueduct; *Hy*, hypophysis; *J*, infundibulum; *O*, optic chiasm; *Th*, optic thalamus; V_3V_4, third and fourth ventricles. Vertical lines represent the region in which a lesion induces sleep; horizontal lines designate the region in which a lesion causes inability to sleep. After C. von Economo (The Pathology of Sleep, Handbuch der normalen und pathologischen Physiologie, Berlin, **17,** Julius Springer, Correlation III, 1926).

innervation.[19] It is possible, as Redlich has suggested, that these two centers may occupy neighboring areas in the brain and that both may be disturbed by a single lesion. In attempting to localize this area, Redlich speaks of the posterior wall of the third ventricle, and the neighboring gray matter of the interpeduncular region, the aqueduct and the tegmentum. A diagram of Economo reproduced here outlines the location of this supposed sleep center. In the postencephalitic cases, in all probability the lesions are inflammatory. Whether the area may be irritated indirectly by endocrine disease, as Redlich and Matzdorff

19. Coman, F. D.: Observations on the Relation of Sympathetic Nervous System to Skeletal Muscle Tonus, Bull. Johns Hopkins Hosp. **38**:163-188 (March) 1926.

believe, it is impossible to say. In the case here reported, the low basal metabolic rate and the improvement following the giving of thyroid suggest such an action. However, the occurrence of an outspoken attack on the sixteenth day of thyroid medication suggests that the action of the drug may be only that of a stimulant masking the minor symptoms of the disease, but unable to prevent the major attacks.

SUMMARY

1. A case report is given of a child, aged 7 years, with a symptom complex corresponding to "narcolepsy" as described by Gélineau. This patient improved markedly under treatment with thyroid extract.

2. The electrical conductivity of the patient's skin, as recorded by the string galvanometer and an electrode in the palm of each hand, showed a pronounced variation from the normal.

3. The term—"emotional asthenia"—is suggested to describe the sudden attacks of weakness which narcoleptic patients may experience following excitement.

4. The desirability of not arriving at a diagnosis of true narcolepsy in the absence of emotional asthenia is emphasized. Some of these cases may be classified as "symptomatic narcolepsy."

5. A report of a case in a child, aged 11 years, belonging to the group "symptomatic narcolepsy" also is given. This patient did not improve under treatment with thyroid.

6. The suggestion is made that narcolepsy does not represent a disease sui generis, but rather is a symptom complex depending on injury of a localized brain area.

NEUROMUSCULAR DYSFUNCTION OF THE BLADDER AS A CAUSE OF CHRONIC PYELITIS IN CHILDHOOD *

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TYPES OF NEUROMUSCULAR DYSFUNCTION

Braasch [1] has divided cases of neuromuscular dysfunction of the bladder into those with definite clinical evidence of involvement of the central nervous system, and those in which the lesion is limited to the terminal nerves of the bladder. The first type is termed cord bladder because of associated disease of the spinal cord; the second is the atonic bladder, so-called because of flabby musculature and diminished expulsive power. In describing cases of chronic retention of urine, Beer [2] subdivides the neuromuscular group into those cases associated with: (1) Disease of the brain, (2) disease of the spinal cord, and (3) spasticity of the bladder sphincter without neurologic signs. Cases of the first and second types would correspond to those of so-called cord bladder; the third group is similar to the group of atonic bladders. In later publications Beer considers that in some of these cases retention is due to obstruction at the neck of the bladder. In three cases operation relieved the condition. In two cases a wedge-shaped area was removed from the neck of the bladder, and in the third a fold of mucosa which acted as a valve was resected. Fordyce and Capon [3] report two cases of idiopathic hypertrophy of the bladder that probably can be classified under neuromuscular dysfunction. The cases described by Frankl-Hochwart [4] and Blum [5] showed no evidence of anatomic obstruction, so it is probable that the loss of vesical function secondary to changes in the central

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1. Braasch, W. F.: Data with Regard to Lesions of the Nerves of the Urinary Tract, J. Urol. **13**:383-398, 1925.

2. Beer, Edwin: Chronic Retention of Urine in Children, J. A. M. A. **65**: 1709-1712 (Nov. 13) 1915; Chronic Retention of Urine in Young Boys Due to Obstruction at the Neck of the Bladder, Ann. Surg. **79**:264-269, 1924; The Importance of the Recognition of Surgical Diseases in the Urinary Organs of Children, Internat. Clin. s. 23, iii, 272-287, 1923.

3. Fordyce, A. D., and Capon, N. B.: "Idiopathic" Hypertrophy of the Bladder, Brit. J. Child. Dis. **21**:1-18, 1924.

4. Frankl-Hochwart: Quoted by Beer, footnote 2.

5. Blum, Victor: Zur Kenntniss der Harnretentionen im Kindesalter und zur Frage der Pyocyaneussepsis, Wien. med. Wchnschr. **57**:2257-2264, 1907.

nervous system accounted for the distention of the upper urinary passages.

Extensive lesions of nerves of the bladder, rectum and lower extremities, which give rise to complete lack of sphincter control and loss of function of the muscles of the legs, are often associated with spina bifida. The relationship of spina bifida occulta and the associated myelodysplasia to such disturbances is difficult to evaluate. Spina bifida occulta is not an infrequent finding in the routine examination of patients with some urinary infection, even when there are no symptoms referable to the defect. Chute [6] has pointed out that retention or incontinence which does not begin until late in life may be caused by faulty innervation produced by spina bifida. Braasch emphasizes the difficulty of determining the etiologic relationship of spina bifida occulta to the lesion of the urinary tract when there are no sensory changes in the perineum or adjacent areas of skin. In mild cases there is a spastic condition of the prostatic urethra, without relation of the sphincter. Relaxation of the sphincter and prostatic urethra may develop later. In six of fifteen cases at the Mayo Clinic spina bifida occulta was found, and in three there was marked deformity of the sacrum and coccyx.

ONSET AND DIAGNOSIS

Since January, 1921, fifteen cases of neuromuscular dysfunction of the bladder have been observed in children at the Mayo Clinic. Their ages ranged from 1 week to 14 years. Six cases were in boys and nine in girls. The onset in most cases was at birth. In one patient, 6 years of age, symptoms had been present for only a year; in another, 8 years old, the duration of symptoms was three years, and in a third patient, a boy of 12, symptoms had existed only four months.

Diagnosis of cord bladder was made in nine cases after cystoscopic examination. In another case of cord bladder, cystoscopic examination was not carried out. Four cases of atonic bladder (neuromuscular dysfunction associated with lesions of the plexus or nerves of the bladder) were observed. In this type of case there may be loss of motor power only, or loss of both motor and sensory power. A single instance of very marked relaxation of the urethra was found in a girl, aged 7 years, who had absolutely no urinary control. The urethra was open sufficiently wide to admit the cystoscope without dilatation.

The most common complaints were incontinence and frequency. Seven patients had no urinary control whatsoever; six were troubled with frequency of urination; one complained of difficult urination, and one of enuresis. In most cases the bladder could be emptied only by

6. Chute, A. L.: The Relation Between Spina Bifida Occulta and Certain Cases of Retention, J. Urol. **5**:317-324, 1921.

voluntary effort of the abdominal muscles, and then only partially. All but one patient had had attacks of fever and, on admittance, were suffering from definite pyuria.

Another striking feature was the round or pyriform tumor above the symphysis pubis but not always in the median line, which disappeared on catheterization. The tumor was present in eight cases, and in seven the residual urine apparently was not sufficient to make the bladder palpable above the symphysis.

Fig. 1 (case 1).—Roentgenogram showing sacral defect.

In most cases the amount of pus in the urine was evidence of marked urinary infection. In several cases, about half of the urine, after settling, was made up of pus. Culture of the urine showed *Bacillus coli* in nine cases, and *Bacillus proteus, Bacillus capsulatus-mucosus* and staphylococcus each in one case. No culture was made in three cases.

The function of the kidney was not so seriously impaired in these cases as it was in those reported by Beer and others. The output of phenolsulphonphthalein was 20 per cent or less in only two instances;

in the other four in which it was tested it varied from 45 to 70 per cent. The blood urea was practically normal in nine of the ten cases in which it was determined. In two cases it was less than 20 mg., in five between 20 and 30 mg., and in two between 30 and 35 mg. In one case it was 90 mg.

Roentgenograms of the kidneys, ureters, and bladder showed nothing abnormal in these organs, but spina bifida occulta was found in six cases and in three marked deformity of the spine. In case 1, the spinal canal was wide open from the fourth lumbar to the fourth sacral vertebra

Fig. 2 (case 14).—Roentgenogram showing sacral deformity.

(fig. 1). In case 14, the fifth lumbar vertebra appeared deformed and the canal incompletely closed (fig. 2). The entire sacrum was deformed and apparently rotated to the left, individual segments being difficult to make out.

Cystoscopic examination definitely established the diagnosis, although the history and roentgenograms frequently made a presumptive diagnosis possible. Details of the cystoscopic examinations are given in the tabula-

tion. Trabeculation and hypertrophy of the bladder, as well as relaxation of the internal sphincter, were evident. Reflux into the ureters was found in only four cases, was not present in six, and was not looked for in five. All cystograms showed that the bladders were large and cone-shaped, and in some cases irregular and trabeculated. One pyelogram was negative; one showed dilatation of both ureters and pelves; in one the right ureter was dilated, and in another the right ureter was dilated and the left ureter was not located.

TREATMENT

Interference with the normal drainage of urine is the most important predisposing cause of infection of the urinary tract, and so in practically all cases of neuromuscular dysfunction of the bladder the kidneys become infected sooner or later. In case 2, infection occurred during the first week of life, and in case 12 not until after the operation. Without reestablishment of proper drainage, it is almost impossible to clear up infection of the urinary tract. The kidneys must be protected as much as possible from back pressure and from infection.

Flushing of the urinary passages is perhaps the most important single item of treatment, as it is in uncomplicated pyelitis. Of equal importance is the prevention of excess accumulation of urine by draining the bladder at regular intervals. The use of methenamine with ammonium chloride, in addition to the forcing of fluids, has sometimes reduced the amount of pus very markedly, but does not clear up the infection. Local applications only temporarily reduce the evidence of infection. Surgically, there is very little to suggest. In certain cases without infection of the upper urinary passage, or with only slight involvement, transplantation of the ureters into the sigmoid, as in exstrophy of the bladder, may be attempted if there is not too great dilatation of the ureters. This procedure was carried out in case 14.

The outlook in these cases is bad, because eventually the back pressure on the kidneys and resulting infection will produce acute sepsis or reduction of renal function followed by death in uremia.

REPORT OF CASES

CASE 1.—A boy, aged 6 years, was seen at the clinic, Feb. 9, 1922. Swelling at the base of the spine and increase in the size of the head had been present since birth. He had never had control of the bladder.

At examination, spina bifida, including the fourth and fifth lumbar vertebrae and both sacral segments, was found. There was congenital dislocation of both hips. The urine, which contained pus 4, showed *Bacillus capsulatus-mucosus* on culture. Methenamine greatly reduced the number of bacteria.

CASE 2.—The patient, a girl, was born Nov. 10, 1922. Nine days after delivery the mother had cystitis and fever. Three days after birth the child's abdomen was large and tense. Three days later the urine was turbid and contained many pus cells; a catheterized specimen contained pus 4 and staphy-

Analysis of Fifteen Cases of Neuromuscular Dysfunction of the Bladder Resulting in Chronic Pyelitis

Case	Sex*	Age, Years	Symptoms	Duration	Pus in Urine, grade	Organism	Phenolsulphonephthalein Return, per Cent	Blood Urea, Mg.	Roentgenogram of Kidney, Ureter and Bladder	Residual Urine, Cc.	Tumor Above Symphysis	Cystoscopic Report	Urographic Findings	
1	♂	6	Incontinence	Life	4	Bacillus capsulatus-mucosus	..	..	Sacral deformity, spina bifida	...	+	.....	.....	.....
2	♀	1 week	Frequency	Life	4	Bacillus coli	..	..	Negative	180	+	Atonic bladder	.....	.....
3	♀	6	Frequency	Life	4	Bacillus coli	..	20	Spina bifida	180	+	Cord bladder	.....	.....
4	♀	3	Incontinence	Life	2	Bacillus coli	..	..	Absence, sacral segments	...	..	Cord bladder	.....	.....
5	♀	3	Difficult urination	1.5 years	4	Bacillus coli	45	16	Negative	18	.	Cord bladder	No reflux	.....
6	♀	6	Enuresis	1 year	..	Bacillus coli	45	24	Negative	120	+	Cord bladder	Left kidney not found; right ureter and pelvis dilated	Irregular-shaped bladder
7	♂	14	Incontinence	Life	3	....	15	32	Shadow, right	480	+	Atonic bladder	Right ureter dilated	.....
8	♀	10	Incontinence	Life	1	.....	..	32	Spina bifida	150	..	Cord bladder	.....	Huge bladder
9	♂	4	Frequency	3 years	3	Bacillus coli	65	24	Spina bifida	120	..	Atonic bladder	No reflux	Dilated bladder
10	♂	6	Incontinence	Life	3	Bacillus coli	..	90	Negative	120	+	Cord bladder	No reflux	Cone-shaped bladder
11	♀	10	Frequency	Life	3	Bacillus proteus	20	..	.....	50	..	Atony, urinary tract	Regurgitation; ureters and pelves dilated	Irregular-shaped sacculated bladder
12	♀	7	Incontinence	Life	3	Bacillus coli	..	22	Negative	...	..	Relaxed sphincter	Normal	.....
13	♂	8	Frequency	3 years	4	Staphylococcus	..	16	Spina bifida	270	+	Cord bladder	.....	.....
14	♀	10	Incontinence	Life	2	Bacillus coli	70	28	Sacral deformity	270	+	Cord bladder	.....	.....
15	♂	12	Frequency	4 months	..	.....	..	..	Spina bifida	17	..	Cord bladder	No regurgitation	Cone-shaped bladder

* In this column, ♀ indicates female; ♂, male.

lococcus on culture. *Bacillus coli* later replaced the staphylococcus. Treatment with a variety of drugs was ineffectual. On cystoscopic examination, when the patient was 10 months of age, the bladder was found to be atonic. There was 180 cc. of residual urine, moderate relaxation of the internal sphincter, and slight chronic diffuse cystitis. The kidneys were apparently normal and roentgenographic examination of them, of the ureters and of the bladder was negative. Methenamine and ammonium chloride have been given at intervals without any appreciable reduction in the number of bacteria. For the last few months she has had no special treatment. Her general condition is good.

CASE 3.—A girl, aged 6 years, was examined at the clinic, Aug. 31, 1923. From infancy she had had occasional attacks of fever and emesis. At 2 years of age she had had influenza, and at 4 years of age, a severe attack of scarlet fever. Five days after birth she had developed a sore around the rectum which did not heal for three months. During this time she had been kept on one side and the hips became asymmetrical. Since birth she had had frequency and urgency of urination. For ten months she had had abdominal pain on urination. Frequent catheterization had been necessary. After catheterization one week before examination, she had passed considerable bright red blood from the bladder and had complained of increased pain in the lower part of the abdomen.

The patient was well developed and well nourished. The Pirquet reaction was positive. Spina bifida occulta of the second sacral vertebra was shown by roentgenogram of the kidneys, ureters and bladder. The urine, which contained pus 4, showed innumerable colon bacilli and a few streptococci on culture. The blood urea was 20 mg. The neurologists suggested the possibility of a myelodysplasia with cord bladder. Cystoscopic examination showed cord bladder, with from 180 to 240 cc. of residual urine and grade 2 cystitis. Lavage of the bladder and frequent catheterization were advised to develop the musculature.

CASE 4.—A girl, aged 3 years, came to the clinic, Sept. 2, 1924. She had never learned sphincter control. She had had frequent attacks of abdominal pain and unexplained fever.

The child was small, underweight and appeared tired. Pus 2 was present in the urine, which on culture showed *Bacillus coli* and streptococcus. Roengenograms revealed congenital absence of sacral segments. On cystoscopic examination the bladder was found to be distended and trabeculated. A diganosis of cord bladder was made. Treatment with methenamine and ammonium chloride was advised.

CASE 5.—A girl, aged 3 years, who had had acute attacks of abdominal pain without fever for the last eighteen months, was seen at the clinic, Oct. 11, 1923. These attacks had occurred about every two weeks. Between periods of attacks she had had no pain or discomfort. Pus had been found in the urine, and the patient complained of difficult urination.

The child was well nourished. Urinalysis showed pus 4 with *Bacillus coli* on culture. The blood urea was 16 mg.; the output of phenolsulphonephthaline was 45 per cent. Roentgenographic examination of the kidneys, ureters and bladder was negative. Cystoscopic examination showed cord bladder with no evidence of reflux. There was 18 cc. of residual urine. The mother was advised to wash the child's bladder daily. Recent reports from the physician who is taking care of the child state that there are large amounts of pus in the urine, but that the patient's general condition is good.

CASE 6.—A girl, aged 6 years, came to the clinic, June 1, 1925, complaining of acidosis of one year's duration. She had always had mild attacks of vomiting with fever, which had become more severe. Recent urologic examination had demonstrated residual urine. She had always suffered from enuresis.

The patient was poorly nourished. The bladder was distended. The urine showed *Bacillus coli* on culture. The blood urea was 16 mg. The phenolsulphonphthalein output was 45 per cent. Roentgenographic examination of the kidneys, ureters and bladder was negative. Cystoscopic examination showed a

single ureter in the median line, apparently in the middle of the trigone. The bladder was dilated. The pyelogram showed that the right ureter was dilated. The left kidney was either functionless or absent. Methenamine with daily catheterization was advised.

CASE 7.—A boy, aged 14, came to the clinic because pus had been found in the urine and a roentgenogram of the kidneys had been questionable. He had had incontinence since birth and occasionally had pain in the left side.

The patient was much underweight. No tenderness was felt on palpating the abdomen. There was no palpable enlargement of the kidneys. The urine showed pus 3. The output of phenolsulphonphthalein was 15 per cent. The blood urea was 32 mg. Roentgenograms of the kidneys, ureters and bladder showed a questionable shadow on the right side. Cystoscopic examination revealed a huge, atonic bladder. There was no evidence of relaxation of the sphincter, but there was possible reflux into the left ureter. The right ureteral area was obscured by the shadow of the bladder. The residual urine amounted to 48 cc. A diagnosis was made of right sided hydronephrosis with infection, and hydro-ureter with a normal meatus.

CASE 8.—A girl, aged 10 years, was seen at the clinic, Sept. 9, 1925. She had had incontinence of the bladder and rectum since birth. The urine contained pus 1, but no culture was made. Roentgenographic examination of the spine showed spina bifida occulta of the upper sacral segment. Cystoscopic examination showed a cord bladder with normal sensation and 150 cc. of residual urine.

CASE 9.—A boy, aged 4 years, came to the clinic, Nov. 16, 1925. Three years before he had had fever of 104 F., had been drowsy and listless, and had lost his appetite. At that time pus had been found in the urine, and the patient had recovered under alkaline treatment. Since this attack there had been similar upsets, accompanied occasionally with pus and blood in the urine, as well as with urgency and frequency. A year before examination he had developed an ataxic gait with loss of reflexes in the muscles of the leg. At the same time retention of urine had been noticed. Methenamine had been administered and catheterization performed twice daily, about 120 cc. of residual urine being obtained each time. During the last eight months he had regained the use of his legs.

The patient was well developed and well nourished. The knee jerks were slightly exaggerated. He had no definite ataxia. Except for the finding of cord bladder the neurologic examination was essentially negative. The urine contained pus 3 and showed *Bacillus coli* on culture. There was spina bifida of the first sacral vertebra. The phenolsulphonphthalein output was 65 per cent. The blood urea was 24 mg. Cystoscopic examination showed a markedly dilated atonic bladder, with no reflux.

CASE 10.—A boy, aged 6 years, came to the clinic, Nov. 24, 1925. He had never been able to control the bladder sphincter. He appeared to be poorly nourished. There was a mass in the region of the bladder extending to the umbilicus. The right kidney was palpable. The urine showed pus 3 and *Bacillus coli* on culture. The blood urea was 90 mg. Roentgenographic examination of the kidneys, ureters and bladder was negative. Cystoscopic examination revealed a markedly trabeculated, cone-shaped bladder with a capacity of about three times normal and evidence of relaxation of the internal sphincter. There was no reflux. A diagnosis was made of cord bladder. Methenamine and ammonium chloride were advised.

CASE 11.—A girl, aged 10 years, came to the clinic, June 9, 1924. She had had frequency of urination since infancy. During the day there was no incontinence, but nocturnal enuresis had always been present. Until two years before she had felt burning on urination and had had frequent attacks of sharp, abdominal pain. Four years before, albumin had been found in the urine.

The patient was well nourished. The urine showed pus 3 and staphylococcus on culture. This was later replaced by *Bacillus proteus-Asiaticus*. Treatment with hexylresorcinol, methenamine and lavage of the bladder resulted in no benefit.

Cystoscopic examination showed an irregular, sacculated bladder (fig. 3), with regurgitation up both ureters into pelves and calices, which were slightly dilated. Diagnosis was made of congenital atony of the entire urinary tract.

CASE 12.—A girl, aged 7 years, was seen at the clinic, March 22, 1926. Since birth there had been incontinence of the bladder. Because of the constant dribbling, the vulva and buttocks were almost continually irritated.

Physical examination was essentially negative, except that there was no control of urination. Roentgenographic examination of the kidneys, ureters and bladder was negative. The blood urea was 22 mg. Cystoscopic examination revealed the kidneys and ureters to be normal. The bladder sphincter was relaxed. A

Fig. 3 (case 11).—Cystogram showing irregular, sacculated bladder.

plastic operation was performed on the urethra. Apparently the vagina was double. Following the operation, control of the urine for three-quarters to one hour was achieved. A specimen of urine after the operation showed pus 3 and *Bacillus coli* on culture.

CASE 13.—A boy, aged 8 years, was admitted to the clinic, Aug. 25, 1923. Three years before, he had begun to have nocturnal and diurnal enuresis with urgency and frequency of urination but no pain. Enuresis had become more severe during the last few months.

Examination showed spina bifida of the fifth lumbar and sacral segments. There was a visible, palpable tumor over the symphysis. The child could void only a few drops at a time. The urine showed pus 4, albumin 2, and staphylo-

coccus on culture. Cystoscopic examination showed definite cord bladder with 270 cc. of residual urine. There were multiple small circumscribed areas of cystitis. There was no evidence of stricture of the urethra. The bladder was emptied by catheter daily for three days, with marked improvement in symptoms and decrease in the amount of residual urine.

CASE 14.—A girl, aged 10 years, came to the clinic, Nov. 17, 1924, because of attacks of fever, vomiting and general weakness which had been present for years. She had always had urinary incontinence with some retention.

At examination, the right scapula was found to be elevated and the right leg smaller than the left. There was marked deformity of the chest. The urine showed pus 2 and *Bacillus coli* on culture. The output of phenolsulphonphthalein was 70 per cent; the blood urea was 28 mg. A roentgenogram showed congenital deformity of the sacrum (fig. 2). Neurologists found a cord bladder, with sensory and motor disturbances in the lower lumbosacral region. There was a possible epilepsy-migraine syndrome. Cystoscopic examination showed a greatly distended, pyriform bladder with irregularity suggestive of cellules and trabeculation. Diagnosis of cord bladder was made. The child was sent to the hospital and given methenamine for a few days before operation on December 2. The right ureter was transplanted into the sigmoid. Several week later methenamine and ammonium chloride were begun again, as cultures of the urine continued to show innumerable colon bacilli. After leaving the hospital, the patient developed optic atrophy and symptoms of intracranial pressure.

CASE 15.—A boy, aged 12 years, came to the clinic, Jan. 8, 1926. For the last few months he had been troubled with frequent urination, voiding seven or nine times a day. He had not suffered from enuresis. He was well developed and well nourished. Roentgenograms of the spine showed spina bifida of the first sacral vertebra. Cystoscopic examination showed a definite cord bladder with relaxed internal sphincter. The lateral walls of the prostatic urethra appeared as lateral lobes.

SUMMARY

Fifteen cases of neuromuscular dysfunction of the bladder in children, whose ages range from a few days to 14 years, are reported. Ten of the cases are of the cord-bladder type, four of the atonic type, and in one there was complete relaxation of the bladder sphincter. The prognosis in such cases is poor and treatment is difficult. Treatment of the complicating infection, chronic pyelitis and cystitis by the usual methods is practically always unsuccessful. Development of surgical methods of relief offers the only hope.

RETENTION OF URINE IN CHILDREN WITH AND WITHOUT DEMONSTRABLE CAUSE*

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The object of this paper is mainly to place on record two very unusual cases of retention of urine in children. At the same time four other cases of retention are presented, to illustrate some of the less uncommon forms of this condition occurring in childhood. All of these cases may serve to emphasize the insidiousness with which the condition may begin and the importance of early diagnoses. Even in adults, it is often found that the common symptoms of frequency and difficulty of urination are absent in the earlier stages, and it is only after a considerable period of time has elapsed that the patient begins to suffer with secondary symptoms, usually the result of faulty elimination on the part of the kidneys.

The symptoms most commonly observed are loss of weight and strength, gastric disturbances with attacks of nausea, sometimes headache and dyspnea, and usually secondary anemia resembling that of nephritis. Needless to say, in children who are unable to express themselves, such conditions may become apparent only in late stages, often too late for surgical intervention that would lead to a permanent relief of the condition.

REPORT OF CASES

CASE 1.—*History.*—J. B., a boy, aged 4 years, with spina bifida and clubfoot, was admitted to the Children's Hospital, December, 1924, with incontinence of urine and feces, from which he was suffering since birth, and an unhealed circumcision wound. The child was an inmate of an orphan asylum in a distant city, where circumcision had been performed two years before. On treatment, the circumcision wound healed after a while.

Physical Examination.—The patient seemed well nourished and of normal mentality. The forehead was prominent, the teeth were erupted and the tonsils were hypertrophied. The thorax flared widely outward at the costal margin, but no rachitic rosary was demonstrable. The heart and lungs were normal. The abdomen was prominent and soft, permitting the palpation of an overdistended bladder. The left foot was clubbed (equinovarus) and there was evidence of paralysis of the peroneal muscles. Knee and ankle reflexes were present, and tactile sensation was normal except for a small area of anesthesia around the anus. The rectal sphincter appeared relaxed. The genitals were normal.

The spina bifida appeared in the form of a small orange sized sac, bulging toward the left side of the sacrum without any evidence of inflammation. A definite bony defect could be made out in the center.

* Received for publication, June 28, 1926.

A soft rubber catheter was passed easily into the bladder without the usual discomfort, suggesting at least a partial anesthesia of the urethra. The kidney function test with phenolsulphonphthalein yielded a return of 80 per cent of the dye in two hours. A cystogram showed an oval shaped bladder drawn toward the right with the sphincter relaxed, which allowed the cystographic solution to fill the proximal part of the posterior urethra (fig. 1).

Fig. 1 (case 1).—An oval shaped bladder drawn toward the right.

Cystoscopy under anesthesia showed a markedly hypertrophied and trabeculated bladder. The mucous membrane was thickened and reddened, the urethral orifices were normal, without any evidence of regurgitation. The relaxed sphincter permitted the cystoscope to be withdrawn into the posterior urethra nearly to the verumontanum.

Roentgen-ray examination of the spine in the anteroposterior view showed lack of union of the sacral body opposite the left sacro-iliac joint. In the lateral view, an absence of the second and third sacral spines could be seen (fig. 2).

Diagnosis and Treatment.—The diagnosis in this case was obvious because of the presence of the spina bifida. However, in the absence of external deformity in the region of the spine, the true condition may be easily overlooked. Briefly summarized, the important features leading to the diagnosis of such cases are: History of incontinence of urine and feces since birth; the presence of an overdistended bladder; relative anesthesia of the urethra in passing a catheter and the

Fig. 2 (case 1).—Absence of the second and third sacral spines.

presence of residual urine in the bladder; relaxed rectal sphincter with an area of anesthesia surrounding the anus and buttocks; relaxed bladder sphincter on cystography or cystoscopy. Roentgen-ray examination finally, especially if taken laterally, will reveal the bony malformation.

With regard to treatment, it is obvious that nothing can be done toward a cure. These patients eventually die of an ascending cystopyelonephritis following catheterization, or the use of the indwelling catheter.

CASE 2.—*History.*—R. R., a boy, aged 2½ years, was admitted to the Children's Hospital, July 1920, with the following complaints: Dribbling of urine, discomfort in the lower abdomen, and progressive loss of weight and strength. The child was apparently normal at birth. He was nursed for six months and then was placed on the bottle. At 13 months the child weighed 23 pounds (10 Kg.). Since then his health began to fail and the weight became stationary. About a year later the mother noticed that the child had a tendency to void at least every half hour, and instead of voiding normally the stream was interrupted, dribbling, as it were. Later, an overdistended bladder was demonstrated.

Examination.—July, 1920, an emaciated and anemic child of toxic appearance was seen. The general physical examination was negative. The external genitals were normal. In the abdomen an overdistended bladder was palpated. The kidney regions were not tender. Under light anesthesia, a no. 9 Coude catheter appeared to meet an obstruction at the neck of the bladder, but after some manipulation was passed into the bladder. The urine withdrawn was clear; the bladder did not appear to be entirely emptied at first. On further manipulation and rotation of the catheter, the latter seemed to slip into another cavity after which complete emptying was accomplished, resulting in disappearance of the abdominal swelling.

A roentgenogram of the bladder was negative as to stones. A cystogram showed slight peripheral irregularity, probably due to adhesions, but otherwise the outline of the bladder and the sphincter were normal.

The day following the examination the child was removed from the hospital to his home in a nearby city, where he died without further urologic study.

Diagnosis.—It is clear that this patient suffered from some form of urinary obstruction, the nature of which was not certain; yet it was not improbable that we were dealing here with one of those rare cases of congenital valve formation of the posterior urethra which will be discussed in conjunction with case 3. There seems also to have been a contracture of the neck of the bladder. At any rate, this represents a case which might have been amenable to surgical treatment. Death was due to renal retention resulting in uremia.

CASE 3.—*History.*—C. M., a boy, aged 10 years, entered the Buffalo General Hospital, Jan. 23, 1925. Complaints: Constant desire but inability to urinate, necessitating catheterization; loss of weight and strength; attacks of nausea and vomiting; pain in the abdomen and in the back radiating to the hips.

The difficulty in urination had been present constantly since birth. In early childhood an attempt at urination would be preceded by a reddening of the face. After the apparent end of urination, urine would continue to dribble away and the patient would be unrelieved, attempting to void again almost immediately. The incontinence appeared to be somewhat better in the summer. A year ago hematuria was noticed (the patient is said to have passed about a pint of blood, but this has not recurred). The patient has always been sickly and peevish, suffering with frequent headaches. He has also had frequent attacks of nausea and vomiting. Four weeks prior to examination the mother noticed a swelling over the bladder region, and at this time a convulsion occurred, lasting a half hour. For twenty-four hours following the convulsion, the patient lay in an alternating stupor and maniacal frenzy, requiring restraint. For three weeks following this he was jaundiced. During the past week there had been complete retention, necessitating catheterization.

Examination.—The patient showed fairly good nutrition but poor color. The tongue was coated and the teeth were in poor condition. The heart and lungs were normal. The neurologic examination was negative. In the abdomen a large distended bladder was felt above the umbilicus.

Rectal examination revealed a normal sphincter and a greatly enlarged fluctuating prostate (prostatic abscess following catheterization?).

Roentgenograms of the spine and urinary tract were negative.

The bladder was slowly decompressed for several days by an indwelling catheter, after which the prostatic enlargement disappeared.

On cystoscopy, obstruction to the introduction of the instrument was experienced near the bladder. The bladder wall appeared greatly hypertrophied and trabeculated. The mucous membrane was thickened and showed the appearance of a hemorrhagic cystitis. The interureteric ridge appeared hypertrophied and a deep cul-de-sac formed behind it. Both ureteral orifices, especially the left, appeared dilated. The vesical sphincter seemed normal. The posterior urethra could not be viewed with the instrument used.

After several days of drainage the bladder was opened suprapubically. The bladder wall was found to be at least one-half inch thick. The mucous membrane and interureteric ridge were as found cystoscopically. The trigone was dissected free posteriorly and carried down nearly to the sphincter, forming a definite bar with the deep cul-de-sac behind. The finger passed easily through the sphincter into the urethra which was so dilated that no resistance was offered. An obstruction was met just anterior to the verumontanum in the shape of a membrane which felt exactly like a hymen with a small central opening, and which was quite thin but very tough and fibrous. On passing a catheter through the urethra, a second opening was found below and to the left, probably a false passage. It was now clear that the apparently large prostate was represented by an enormously dilated posterior urethra.

The membranous diaphragm forming the obstruction was now destroyed by stretching with the finger and curved forceps, following which instruments passed easily both ways. The trigone was next divided and sutured, following the technic of Young, thus obliterating the cul-de-sac and allowing free drainage. The bladder wall was then sutured around the Pezzar catheter, and the abdominal incision was closed in the usual way.

The patient made an uneventful recovery and has remained well to date, without any further difficulty in urination.

Diagnosis.—In this case the valve formation of the posterior urethra was definitely demonstrated, and the chronic retention with slowly progressive uremia was promptly cured by proper surgical means. This rare form of obstruction to the flow of urine is generally recognized as a congenital malformation due to hyperplasia of the lower portion of the colliculus seminales, with formation of a valve-like membrane in the posterior urethra. This subject has recently been thoroughly reviewed by Young, Frontz and Baldwin.[1] Theories as to the origin of these anomalies vary, but a recent study by Watson[2] seems to indicate that these obstructing valves have their origin in an anomalous attachment of the lower portion of the colliculus seminales and inferior striae to the roof of the urethra.

CASE 4.—*History.*—D. B., a boy, aged 17 months, has been suffering at times since birth from dysuria. May 23, 1921, the child suddenly developed acute retention of urine but was relieved by catheterization. The following day the retention recurred, and all attempts at catheterization failed, whereupon the child was brought to the General Hospital.

On examination, the child was found to be in acute distress. The bladder was readily palpable, the penis considerably swollen and the foreskin markedly edematous. A stone was palpable in the urethra at the penoscrotal junction.

Under ether anesthesia an attempt was made to dilate the urethra and seize the stone with forceps, without result. Then a small incision was made over the stone, the latter removed, and the urethra and skin closed with two plain interrupted catgut sutures. The stone was the size of a large white bean, very hard, smooth and slate colored. The bladder was drained by a no. 12 Coude catheter, which was passed easily.

The patient was next seen Feb. 23, 1922, because of the dysuria returning. Roengen-ray examination revealed a stone in the bladder, which was removed

1. Young, H. H.; Frontz, W. A., and Baldwin, J. C.: J. Urol. **3**:289 (Oct.) 1920.

2. Watson, E. M.: M. Rec. **92**:583 (Oct.) 1917.

suprapubically. Between these two periods the child had been perfectly well. The urethral incision had healed, the urine remained clear and was voided in a good stream without pain or difficulty.

Diagnosis.—This case is another example of a not uncommon condition in which a complete cure can be instituted by surgical measures providing the condition is recognized.

CASE 5.—*History.*—S. R., a girl, aged 2½ years, entered the Children's Hospital, Aug. 15, 1925, suffering from chronic retention of urine associated with nausea and vomiting. The child appeared normal at birth. For three months she was breast fed and did well except for occasional vomiting after feeding. The mother was quite certain that at 12 months the child had perfect urinary control, and in this respect did not differ from her two other children. The child began to speak at 15 months and to walk at 19 months of age. At this time the vomiting became more frequent, and the patient began to fail slowly.

Examination.—July 28, 1923, the child was found to weigh 17¾ pounds (8 Kg.), and her nutrition appeared unsatisfactory. The condition was regarded as malnutrition. Early in November, vomiting became continuous. The urine was found loaded with pus. There was no elevation of temperature. Jan. 14, 1924, the child weighed 20¼ pounds (9.1 Kg.). There was no marked general improvement. However, the urine showed only 5 to 6 pus cells per field.

The child's condition remained stationary until about August, 1924. On August 4, pus and blood were passed, and the bladder was found to reach nearly to the umbilicus. Palpation of the bladder produced no discomfort. The extremities were now found to be slightly edematous and the general emaciation was marked. Vomiting continued. On catheterization, 225 cc. of turbid, purulent urine was obtained.

Urologic Examination, Aug. 9, 1924.—Under light ether anesthesia, with no. 18 French cystoscope the bladder urine was seen to be turbid and filled with flakes of mucopus. The bladder was the seat of a hemorrhagic cystitis, with marked edema of the mucosa and contraction around the sphincter. Both urethral orifices were wide open and suggested more the entrance of small diverticula. A no. 5 plugged catheter passed the right side easily, from which there was a normal rapid flow of slightly cloudy urine. The catheter on the left side was introduced with some difficulty and the flow from that side was rapid and normal, the urine being clear. Indigocarmine intravenously appeared in only a trace in fifteen minutes, but as the cystoscope had to be removed immediately it remained unknown from which side the dye came. Examination of the bladder urine revealed pus cells and streptococci; urinalysis of both kidneys was the same.

A roentgenogram was negative as to stones. The catheter was high up and showed a sharp kink at the kidney pelvis. A soft rubber catheter was then passed after removing the ureteral catheter, and 60 cc. of 15 per cent sodium iodide solution was placed in the bladder. The next plate showed a large tortuous ureter on the left side with the kink well demonstrated (fig. 3). At this point the examination had to be concluded.

The Wassermann reaction was negative. Phenolsulphonphthalein test showed 3 per cent in the first hour and 7 per cent in the second. Urea nitrogen was 63 mg. per hundred cubic centimeters, and blood chlorides were 444 mg.

The child continued to fail, and, before death, indurated inflammatory masses resembling abscesses developed over the right buttock and in both legs. Death occurred Aug. 24, 1925. Necropsy was not permitted.

CASE 6.—*History.*—L. R., a girl, aged 5 years, entered the Buffalo General Hospital, Oct. 19, 1924, with pain in the right side with intermittent swelling, dribbling of urine, with frequency and dysuria, loss of weight and strength.

While the patient's mother was pregnant, she had suffered from some mild bladder disturbance following an attack of influenza. The child appeared healthy at birth. In August, 1920, after an attack of whooping cough, dysuria developed. In April, 1921, dysuria became quite severe and the patient suffered from constipation.

In May, 1921, a swelling appeared on the right hip and the rectum became prolapsed from constipation. In February, 1922, the patient was taken suddenly ill with chills and fever. This was regarded as pneumonia; however, the temperature was normal the next morning. Subsequently three other such attacks occurred. In March, 1922, an examination of the urinary tract, in another hospital, resulted in the diagnosis of renal and vesical calculi. The roentgen-ray records of that examination could not be found.

Fig. 3 (case 5).—A large, tortuous ureter on the left side.

In August, 1922, the patient entered the same hospital and left it improved after pelvic lavage. Similar treatment was given in April, 1923, resulting in improvement.

In December, 1923, the patient had chickenpox. In September, 1924, she experienced sudden pain in the occipital region and at the tip of the spine, accompanied by nausea and vomiting. Slight jaundice appeared and a large painful swelling developed over the right kidney. The bowels were alternately consti-

pated and loose. In October, she was admitted to the Buffalo General Hospital because of pyuria.

On admission, examination showed a small, thin, poorly nourished and acutely ill child, with a dry and glazed tongue. In the right kidney region a tender mass was felt, and the bladder was found to be distended. On the following day the mass in the right kidney region seemed to have disappeared, while the distention of the bladder remained.

Fig. 4 (case 6).—An enormously dilated right ureter, and a right sided pyonephrosis.

Roentgen-ray examination failed to reveal any stones. Microscopic examination of the urine revealed the presence of pus, with streptococci and colon bacilli. Urea nitrogen determination, 82.2 mg. per hundred cubic centimeters.

For several days catheterization every four hours resulted in some improvement. A cystogram was then taken, which showed an enormously dilated right ureter and a right sided pyonephrosis (fig. 4). On a second plate, taken ten minutes later, the solution could still be seen remaining in the kidney.

On cystoscopy, marked cystitis, hypertrophy and trabeculation of the bladder wall were noted. The right ureteral orifice was gaping and scarred, and did not allow the catheter to pass more than 1 cm. No injection of indigocarmine was undertaken, as the veins were too small, nor did the patient's condition warrant the catheterization of the left ureter.

Phenolsulphonphthalein test showed: First hour, 10 per cent; second hour, 6 per cent.

Improvement continued on intermittent catheterization, and the child was allowed to go home. However, two weeks thereafter, she suddenly became uremic and died. Permission for necropsy was not granted.

COMMENT

Cases 5 and 6 were thus nearly identical, as they were both females and in neither of them could any history of urinary disturbances at birth be discovered. Both patients developed chronic retention, bilateral pyonephrosis, dilated ureters and hypertrophy of the bladder wall, and both died of uremia.

These two cases bear a marked resemblance to those reported as occurring in males due to valve formation in the posterior urethra, very much as in our case 3, and probably in case 2. It is not inconceivable that such a urethra would be freely permeable to any small instrument, and even a cystoscope would hardly show the folds unless they occurred in the bladder proper. However, careful study of the literature as far back as 1800 has failed to reveal a single authentic case of valve formation in the female urethra, although cases of congenital stricture of the female urethra are well known (Manac,[3] Blum,[4] Guyon,[5] etc.). In fact, there is no analogy between the development of the male and female urethras, and therefore no reason to expect similar types of anomaly. In the male, the verumontanum and the striae seem to play a very important rôle in the formation of valves. In the female, the urethra is a simple outgrowth from the urogenital sinus, and has not the glandular appendages found in the male urethra, the active proliferation of which seems to be responsible, according to Watson, for a certain type of valve formation in the male.

In the absence of any necropsy observations in our cases, it will be safe to rely on the clinical evidence of the absence of any mechanical obstruction of the urethra in both these cases. Reasoning then from this standpoint the cases appear to resemble those reported by Ballantyne, with complete retention in the female with no mechanical obstruction whatever in the urethra. This author explains these cases as an obscure disturbance of innervation, analogous to hypertrophic congenital stenosis of the pylorus, without any pathologic evidence of such a case having existed. Another and more plausible possibility in our two cases would be the existence of some spinal cord lesion of either inflammatory or toxic nature, affecting the bladder center.

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3. Manac: Bull. Soc. Anat., 1828.
4. Blum: Arch. gen. de med., 1877.
5. Guyon: Rev. med. chir. de Paris, 1849.

TWO CASES OF OMENTAL CYST AND ONE OF MESENTERIC CYST*

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Reports of isolated cases or of a small group of cases of any physical condition or disease are of value only when the condition or disease is of such rarity that it does not enter the mind of the physician dealing with a questionable diagnosis. This is apparently the case with lymphatic cysts of the omentum, and justifies the following reports.

After a moderately careful perusal of the literature to date, I can find only forty-three cases of omental cysts reported, and it is questionable whether all of these are of lymphatic origin.

REPORT OF CASES

CASE 1.—A girl, aged 8 years, was admitted to the Children's Hospital in January, 1926. The cause for admission to the hospital, according to the parents, was a distended abdomen of three months' duration, and lack of gain in weight. The family history was negative and the patient had always been moderately well, except for measles and constipation, which had been troublesome since infancy. During the present illness, there was no complaint of pain, no coughing or night sweats and the patient never felt feverish, except when severely constipated. The appetite had been fairly good until the last week. There has been an occasional complaint of headache. The child slept well and has always been active.

Physical Examination.—A well developed but rather poorly nourished child was seen. Except for slightly enlarged axillary and inguinal glands and the local abdominal observations, the examination was negative.. The abdomen was markedly distended, flat to percussion and a fluid wave was present. There were no masses, pain, tenderness or spasm. The temperature was 98.6 F.; the weight, 55 pounds (24.9 Kg.) and the circumference of the abdomen, 23 inches. The urine sediment contained an occasional white blood cell and epithelial cell, but otherwise it was normal. An examination of the blood showed the hemoglobin to be 65 per cent; the red blood count, 3,800,000, and the white count, 13,500. A stained specimen contained 61 per cent polymorphonuclears, 33 per cent small lymphocytes and 6 per cent large mononuclears. The Wassermann reaction was negative. A 1:1,000 tuberculin test had a positive reaction. The blood pressure was 90 systolic and 70 diastolic.

One week after admission the abdomen was tapped in the midline, 1 cm. below the umbilicus. Twenty cubic centimeters of fluid was obtained and much more could have been removed. The fluid was chocolate colored and contained a few suggestive broken up red cells. The general condition was unchanged.

The following day the temperature and pulse rate rose. The physical examination showed slight pouting of the umbilicus, but the abdominal circumference remained the same. Anteriorly and posteriorly over the right side of the chest there was dulness at the base, and a suppressed respiratory murmur probably caused by an upward displaced liver. The conjunctivae showed jaundice beginning. A roentgen-ray film of the right side of the chest revealed a slight thickening of the lung markings, but no evidence of tuberculosis.

* Received for publication, Aug. 6, 1926.

On January 25, an omental cyst was excised. The incision was made in the midline just below the umbilicus. The peritoneum was opened and a dark walled cyst was seen in front of the intestines. The incision was enlarged to the left and above the umbilicus until the whole extent could be palpated. It was found to extend from the pelvis into both loins and up over the stomach and liver. The cyst was delivered into the wound with difficulty and with the rupture of at least one of its lobules, spilling a large amount of dark fluid into the peritoneal cavity. After it was entirely delivered, it was found to originate in the great omentum close to the transverse colon. An omental layer was freed from the cyst in all directions until it could be entirely removed. The blood supply seemed small. This left the sac of omentum, which was closed with a running catgut stitch. The abdominal wound was now closed in layers without drainage.

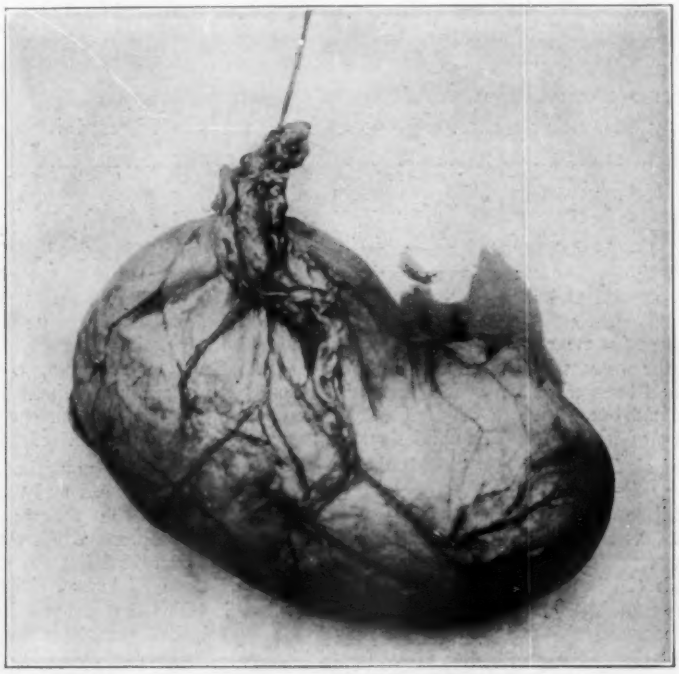

Fig. 1.—Omental cyst.

Pathologic examination of the cyst showed an enormous cystic structure, somewhat lobulated in shape, holding over 1,000 cc. of brownish, cloudy fluid (old blood pigment). The wall everywhere seemed uniformly thin (about 1 mm. in thickness). Many large blood vessels coursed over the surface. The microscopic examination showed the wall to be composed of alternate layers of smooth muscle and connective tissue. It was quite vascular. About many of the blood vessels, aggregations of lymphoid tissue were seen. There was also a slight, diffuse infiltration of the wall, with lymphocytes. There was no evidence of gastro-intestinal mucosa or epithelium in any of the sections. The pathologic diagnosis was omental cyst of lymphatic origin.

The patient's convalescence was uneventful, and two weeks later she was discharged in good condition.

CASE 2.—A girl, aged 8 years, was admitted to the Children's Hospital in January, 1926. The family history and patient's history were irrelevant. The

present illness began five days prior to examination, when, because of a distended abdomen, a doctor was called in. From then until the time of examination, the child complained of headache, general malaise and joint and muscular pain. There was no vomiting. The bowels were regular. The appetite was poor and there had been a loss of weight in the last few months. The physical examination was entirely negative except for hypertrophied tonsils and the distended abdomen, more full on the right side. There was a palpable, movable and fluctuant mass situated deeply in the right side of the abdomen and extending about 2 inches above and below the umbilicus. There was no tenderness. The urine was normal, the white blood count 10,500, and the temperature was 99.8 F.

The day following admission the tumor mass shifted from the right side of the abdomen to the hypogastrium. There was no complaint of pain and the patient generally felt well. Films were taken after a barium meal, which disclosed some adhesions in the right lower quadrant. Cystoscopic examination revealed a double pelvis in the left kidney, but otherwise there was no abnormality.

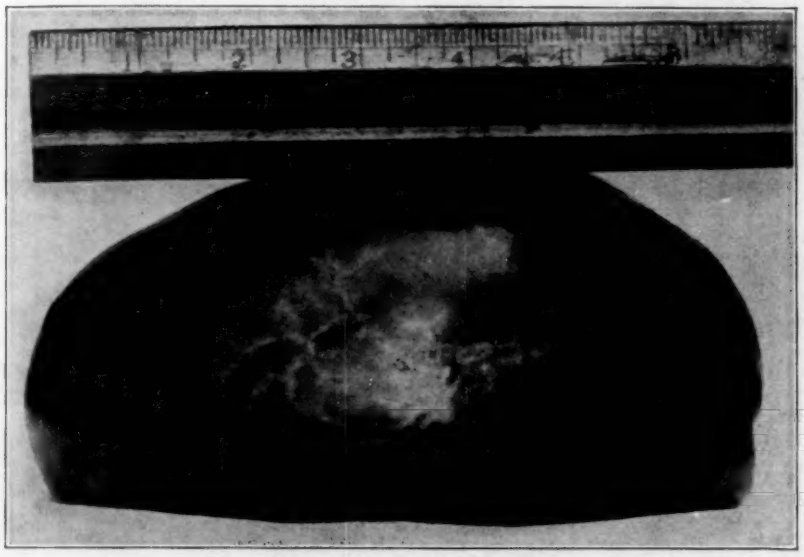

Fig. 2.—Mesenteric cyst.

Two days later operation was performed. The incision was made running from the costovertebral angle, obliquely downward and forward. The kidney and ureter were exposed and found to be normal. The peritoneum was opened and the cyst delivered into the wound with ease; it was found to have a very small pedicle consisting of twisted omentum. This was tied and cut off and the cyst was removed. The peritoneum was closed and the abdominal wound closed in layers without drainage.

Pathologic examination showed a large, cystic, kidney shaped structure measuring 13 by 8 by 6 cm. Its wall was grayish, crossed by many large blood vessels and it was filled with fluid. On palpation, the wall seemed uniformly thin, and there was no suggestion of kidney tissue in it. At one point there was a small amount of omental fat adherent. A catgut ligature was seen at this point, and apparently represented the point of entrance of the blood vessels. The microscopic examination showed the wall to be composed of fibrous tissue mixed with a few strands of smooth muscle. A few aggregations of lymphocytes were seen in the

wall. There was no epithelial lining. The pathologic diagnosis was omental cyst of lymphatic origin (fig. 1).

The convalescence was entirely uneventful, and three weeks later the patient was discharged to a convalescent home in excellent condition.

CASE 3.—A boy, aged 3 years, was admitted to the Children's Hospital in December, 1920. This case of lymphatic cyst is identical in structure with the two other cysts, and seems worthy of brief mention, though it did not occur in the omentum but in the mesentery of the jejunum. The family history and patient's history were unimportant. The present illness began two years prior to examination, with abdominal swelling. There had been no pain until recently, and in the last four days it had been located in the right lower quadrant and about the umbilicus. The appetite was poor during the last two weeks but the patient did not lose weight. The physical examination was entirely negative except for the abdomen which was markedly distended, with a fluid wave and shifting dulness present. There were no palpable masses or no organs felt. The umbilicus was protuberant. The urine was entirely normal and the blood examination showed the hemoglobin to be 85 per cent and the white count 13,600. The temperature was 100 F. A tuberculin test was negative.

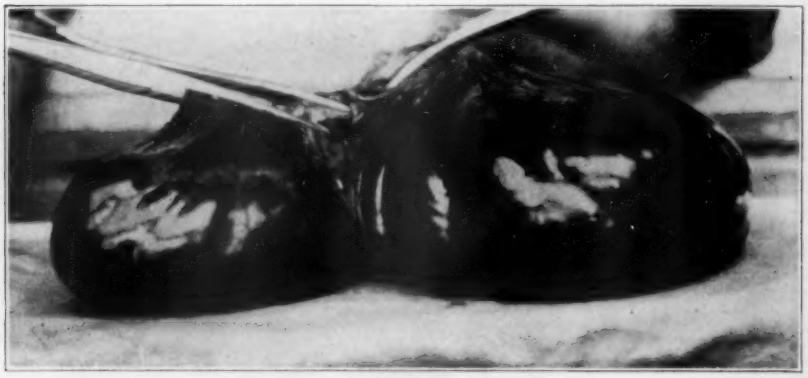

Fig. 3.—Mesenteric cyst.

Three days later, a mesenteric cyst was removed. A median incision was made extending from 1 inch above the pubis up to 2 inches above the umbilicus. The peritoneum was opened, and a large, dark, multilocular cyst of the mesentery of the jejunum was found filling the major part of the abdominal cavity. One side of this was delivered into the wound and freed from the mesentery and bowel and removed. The peritoneum was sewed over the raw surface of the bowel and mesentery with interrupted stitches. The same procedure was performed on the cyst extending from the other side of the mesentery and bowel. The abdominal wound was closed in layers without drainage.

Pathologic examination of the cyst showed it to be indentical in structure with the omental cysts (fig. 2 and 3).

Convalescence was interrupted by intestinal obstruction caused by the appendix adhering to the site of the cyst. This was relieved by a second operation, and the patient eventually recovered and was discharged.

COMMENT

A correct preoperative diagnosis is usually not made, and these three cases were no exception to the rule. The incorrect diagnoses commonly made are tuberculous peritonitis of the ascitic type, ascites,

hydatid cyst, ovarian cyst and cystic kidney. The difficulty of making a correct diagnosis is caused by the vagueness of the symptoms and the interpretation of the physical observations. The extremely large size of the cysts in cases 1 and 3 led to the erroneous deduction that there was free fluid in the abdominal cavity. This is quite easy to understand, as both cysts practically filled the whole peritoneal cavity. The mistake of considering this to be ascitic fluid is one that has been made several times. For example, in a case reported by Halsted [1] and in one reported by Fort,[2] both patients were tapped for ascites. In patients with extremely large cysts the dulness is always found over the whole front of the abdomen. It is my belief that this is not so in any case of free ascites, or when there is fluid from tuberculous peritonitis. This observation might be aided by a lateral ronetgenogram with bismuth in the intestines. It would seem that they must be compressed toward the spine, and the finding of a large layer of fluid in front of them would suggest the encysted location of this fluid. If the patient is tapped, the presence of a chylous fluid containing broken down red cells is another point strongly suggestive of a lymphatic cyst. In the case of smaller tumors, the erroneous diagnosis of cystic kidney or ovarian cyst is more likely to be made. The former may be ruled out by cystoscopic examination and the latter, possibly, by bimanual examination, one finger being placed in the rectum or vagina, according to the patient's age and sex, and the other hand palpating the abdomen. The extreme mobility of a small omental cyst is another factor which should bring it to mind. A negative tuberculin reaction is of aid in ruling out tuberculous peritonitis. If these points were kept in mind, it would seem that a correct diagnosis might at least occasionally be made and the correct treatment, which is extirpation, promptly resorted to. The results of surgical removal in my own cases and in those in the literature are apparently universally satisfactory, and the risk is not great.

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FAMILIAL INCIDENCE OF PYLORIC STENOSIS*

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Two cases of pyloric stenosis that occurred in successive generations of a family are presented. After a careful search of the literature, no similar occurrences can be found. As the first case happened at a time when pyloric stenosis was not readily recognized, and in order to establish the correct diagnosis, the history is given in some detail. Fortunately, the mother of the child kept a written record of the illness, so that the information is fairly accurate.

REPORT OF CASES

CASE 1.—*History.*—G. F., a boy, was born Sept. 12, 1899. He was said to have weighed 12 pounds. He was quite jaundiced soon after birth, but did well on the breast and soon regained his birth weight. On the fourteenth day after birth the child suddenly began vomiting and continued to vomit for six or seven months. The following symptoms were noted:

Projectile vomiting was present. It came out in a forceful gush, "like water from a hose," and sometimes it came through the nose. At times the boy would vomit "over the foot of the bed." One could hear him vomiting from a distance.

Constipation was also present. There were no stools for four or five days at a time, although the patient was given salts throughout the illness. Gastric retention was noted. Although he was fed for only one minute every two hours, he would vomit very large amounts (previous feedings). "At times it seemed like he brought up a pint."

He lost weight so rapidly that in a short time he weighed only 6 pounds (2.7 Kg.). His general appearance was emaciated; he looked like an old man. His appetite was ravenous throughout the illness. The urine was very scanty and brick red. Peristaltic waves were not looked for, but the mother said she could feel heaving when she put her hand on the child's abdomen.

Course.—After the initial loss, the weight remained nearly constant for six months, when the patient showed signs of improvement. At nine months the vomiting had practically ceased, but there were occasional vomiting spells for the next two years.

The physician in attendance diagnosed the condition as "catarrh of the stomach." The patient was given up as hopeless on numerous occasions. He has since grown to be a strong, healthy adult. When he was 26 years of age, his first child was born.

CASE 2.—M. F., a girl, the daughter of the patient referred to as case 1, was breast fed and did well for three weeks. She began to vomit on the twenty-first day. She came under my care when 5 weeks old, presenting typical signs and symptoms of hypertrophic pyloric stenosis, including waves and palpable tumor. I advised an operation because of the rapid loss of weight. A Rammstedt operation was perfomed, but the child died thirty-six hours afterward from postoperative shock.

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* Read before the Hartford Medical Society, June 7, 1926.

COMMENT

In reviewing the literature, one is struck with the familial incidence of this disease, although a great many textbooks tell us that the family history is unimportant.

It has very frequently been observed to occur in two members of a family. Such cases have been reported by Heubner,[1] Finkelstein,[2] Still,[3] Freund,[4] Ibrahim,[5] Grissen,[6] Richter,[7] Rosenhaupt[8] and others.

The occurrence in even three members of one family is not infrequent. Heubner reports a case; Sauer[9] had two families, and Finkelstein also had two families, in each of which three cases occurred. Richter, in Abt's "Pediatrics" says: "A large number of the infants are the first-born, and in a remarkably large proportion of cases the same condition has occurred in the second or third child." In the first reported description of this disease by George Armstrong[10] in 1771, he says, "What is remarkable, this was the third child (and they have never had any more) which the parents have lost at the same age and in the same disease."

Finkelstein mentions a family in which four children had the disease.

There are a few instances in the literature in which the disease has occurred in twins. Davis,[11] Moore[12] and Sauer mention cases.

Cautley and Dent,[13] in discussing one of their cases, remark, "It is worth recording, though we lay no stress on what may be merely a coincidence, that the grandmother on the father's side lost a sister in infancy whose death was ascribed to 'nothing passing through the stomach.'"

Heubner mentions a case somewhat similar to my own. He saw a child, aged 4 years, and obtained from the mother a history from which he concluded that the child undoubtedly had a stenosis. The mother also told him that she had a similar illness for the first six months of her life. But as Ibrahim justly remarks, the diagnosis in the mother's case must remain uncertain.

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Perhaps with the keeping of more accurate and permanent records, and more especially with the lowered mortality of modern surgery, the familial tendency to this disease will be found to be of more importance than has hitherto been attached to it. At least it will be interesting to observe the children of the patients who are fortunate enough to obtain a cure.

NOTE.—Since this article was submitted for publication, I have a third patient in this family. A boy, weighing 10 pounds (4 Kg.), born Oct. 15, 1926, began to vomit on the third day and shows conclusive evidence of pyloric stenosis. Therefore, this disease was manifested in father, daughter and son.

PROGRESS IN PEDIATRICS

SOME IMPORTANT FACTS CONCERNING ACTIVE IMMUNIZATION AGAINST DIPHTHERIA*

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WHAT IS THE SCHICK TEST?

The principle of the Schick reaction is very simple. For a number of years before 1915, the reaction in the skin of guinea-pigs as an index of the neutralization of the standard dose of toxin by the antitoxin was used. If in a test the mixed toxin and antitoxin has an excess of toxin, the skin of the guinea-pig is irritated. If there is an excess of antitoxin, no irritation results and therefore no hyperemic spot appears. In the early investigations of others and of myself on natural antitoxic immunity in man, blood was taken from children and from adults and was tested for antitoxin by the method just described. The results showed that a small percentage of young children and a larger percentage of older children had antitoxin. The idea occurred to Schick that there might be a much simpler way, namely, to introduce a tiny but definite amount of diphtheria toxin in the skin. He hoped that if this toxin met in the skin fluids an amount of antitoxin sufficient to insure immunity, it would be neutralized, but if there were no antitoxin, or an insufficient amount to give immunity, the toxin would be held in the skin more or less unneutralized and, just as in the case of the guinea-pig in which a toxic mixture had been introduced, the skin would be irritated.

A million tests during the past thirteen years have proved beyond doubt that Schick developed an accurate test for the presence or absence of diphtheria antitoxin in the body. Careful investigation has demonstrated that if the blood contains adequate antitoxin for immunity, there will be sufficient in the fluid in the skin to neutralize the standard test dose of toxin. It is evident that if this test is to be employed, sufficient toxin must be injected to cause irritation if insufficient antitoxin is present. It is also rather important that an excessive amount should not be given, for then even an amount of antitoxin in the skin sufficient to insure protection would be insufficient to neutralize the overdose of toxin.

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* Read before the joint session, American Child Health Association and Child Hygiene Section of the American Public Health Association, May 19, 1926.

Experience has taught that the proper dose of toxin is one-fortieth of the amount that would kill a guinea-pig weighing 250 Gm., in 0.2 cc. of salt solution, or one-fiftieth of a fatal dose in 0.1 cc. The practical use of the Schick test has shown that errors may readily creep in which are most confusing. The technic of the Schick test is very simple but it must be carried out with the greatest care. If the fine needle penetrates the layers of the skin too deeply, the fluid escapes into the subcutaneous tissue, and its proper action on the skin does not develop. As all who have performed the test know, the sign of the correct administration of the injection is the raised whitish area which develops because of the pressure of the fluid in the skin. When this appears, one is certain that the test has been properly done. With toxin of uniform strength, the results of repeated tests properly carried out on the same persons have shown remarkable similarity. The possibility of any Schick test being improperly done, or of the toxin being of less than the standard strength, leaves one always a little doubtful of a negative Schick test. I have never seen an undoubted clinical case of diphtheria occur in a child who had recently had a negative Schick reaction after a test performed by an expert, but I have seen several cases occur in those in whom a negative Schick reaction had followed injections of the toxin by those who were not so experienced in doing the test. The use of the Schick test has given much interesting and valuable information about immunity at different ages and under different conditions. For instance, about 45 per cent of adults living in the country are immune, and about 85 per cent of those living in the cities. If a mother is immune her infant is immune at birth, and for some six or twelve months after birth. The presence of this transferred antitoxin and the comparative isolation of babies are the reasons why so few of them develop diphtheria. Between the ages of 1 and 3 years, the great majority of children are shown by means of the Schick test to have no antitoxin. It is general knowledge that this is the most dangerous period of their lives in regard to diphtheria. Year by year, as they grow older, a greater percentage of them develop their own antitoxin, so the percentage giving the positive Schick test declines and diphtheria become gradually less of a menace. Nevertheless, this is a gradual change, and two-thirds of the school children in the country and one-third of those in the city still remain susceptible and need protection.

IS AN ATTACK OF DIPHTHERIA FOLLOWED BY ANTITOXIC IMMUNITY?

Sometimes it is and sometimes it is not. As a rule, slight attacks of diphtheria indicate that the children attacked have a trace of antitoxin in their blood, but not enought to prevent a local infection. These

children react quickly to the stimulus of the absorbed diphtheria toxin, and produce considerable amounts of antitoxin within a few days. If a Schick test is performed at this time, it is negative. On the other hand, the children who develop severe diphtheria have no trace of antitoxin before their attack. About one-half of these develop antitoxin in one or two months, while the other half never develop it. A Schick test performed on persons six weeks after recovery from a severe attack will give a positive reaction in the majority. Before the lapse of four weeks it is apt to be negative in those who received antitoxin because of the traces of the injected antitoxin still in the body.

In institutions in which an outbreak of diphtheria has occurred, not only will some of the severely ill subjects and most of those mildly ill give negative Schick reactions after a time but also many well persons. This has been shown to be due to the fact that at least many of these had become carriers of diphtheria bacilli without developing clinical signs. This at least suggests that the reason why city children become immune more frequently than country children is, as Zingher has emphasized, because the city children have far more chances to become diphtheria carriers. It seems as if recovery in at least some patients with diphtheria untreated by antitoxin is brought about by the development of bactericidal substances rather than by antitoxin.

THE CASE OF THE SCHICK TEST PRIOR TO IMMUNIZATION

A very much debated question is: Under what conditions should children be given the Schick test previous to receiving the toxin-antitoxin? The performing of the Schick test has almost nothing to do with inducing immunization. It simply reveals those who are susceptible. In the earlier days, it was important to know exactly which children were immune and which children were not, so that one could tell the exact percentage of those who were rendered immune, and so that one could judge exactly how long the immunity lasted. With the cessation of the experimental work, the need of performing the Schick test lessened, and now the decision simply depends on whether, in any given age group and locality, it is more trouble and annoyance to make the Schick test and so omit unnecessary inoculations, or to omit the Schick test and inoculate all children. There are always two main points to be considered, namely, the age group and the density of population of the community. Children under 5, whether in the country or in the city, are generally susceptible. As a rule, they should not receive the Schick test before getting the three immunizing injections. In the older age groups the residence of the children is of prime importance. It is known through many tests that children, on the average, become immune younger in large cities than those in the country, so that while in the city schools more than two thirds of the children are immune, the reverse is true in country schools. In the country the Schick test is not used

as a rule, while in the large cities it is. For the last two years on one half of the children of New York, I have been using a modification of the Schick test, in which I give 1 cc. of the standard preparation of toxin-antitoxin subcutaneously. If this is given just beneath the skin of the lower part of the arm, it will serve the purpose of an immunizing injection and at the same time reveal whether the child is immune or not. Those who show no reaction on the fifth and the sixth days are immune, and do not need further injections. Those who do show a reaction are given the second injection of toxin-antitoxin. Dr. Schroder has used this method successfully in over 50,000 school children. It is especially useful in preschool children. In older children and in adults, there is sometimes a difficulty in separating the pseudoreactions from the true reactions. The error if it occurs is on the safe side. This method saves the extra injection for the Schick test and the time taken to read it, and at the same time gives the knowledge that the Schick test would have done. It is possible, of course, to perform a Schick test and give an immunizing injection on the first visit.

THE CONTROL TO THE SCHICK TEST

Among the older children and adults there occasionally are cases in which a reaction to the injection somewhat similar to that of a positive Schick test follows the injection, which reaction is not due to the toxin but to the protein in the solution. This occurs in about 5 per cent, and places some of the probably positive reactions in doubt. To clear up this doubt, besides the injection for the Schick test, an intracutaneous injection is given at another spot of an equal amount of the heated toxin. The heat destroys the toxin but leaves the bacillus protein unaltered. If the reaction was due to toxin, this heated toxin will give no response, but if to this protein, the reaction will appear. For accurate work this Schick control should be given in children over 6 years of age. If we do not inject the control solution, we should immunize all doubtful as well as clearly positive reactions. In the older children and in adults, even the control test may not suffice to settle absolutely the nature of the reactions, because in perhaps 2 per cent of these the protein reaction is so marked and persistent that it is impossible to be sure that this is not a combined protein and toxin reaction at the point of the Schick test even though the reaction to the heated toxin seems as marked as that to the unaltered toxin. The control with the heated toxin is used especially in the Schick tests made some months after the giving of immunizing injections for the purpose of discovering the result of the inoculation.

ARE THERE ANY DELETERIOUS EFFECTS FROM THE SCHICK TEST?

In the very susceptible children the local reaction is sometimes quite marked and lasts for several weeks. For one or two days there may even be 1 degree of fever. No lasting ill effects have ever been noted.

In a very few exceptional adults, who are extremely susceptible to the nonspecific proteins, quite a severe local reaction with blisters may take place from both the control test and the Schick. This result, however, never leaves any permanent trace. A severe reaction has an important bearing on the giving of toxin-antitoxin. These children give more or less severe reactions to the toxin-antitoxin or toxoid. Unless necessary, it is well to omit injections of toxin-antitoxin in them, or if it is necessary to divide the amount into five doses.

SHOULD DOCTORS, TRAINED NURSES AND ATTENDANTS BE GIVEN THE SCHICK TEST?

Decidedly yes. It is thoroughly worth while for any physician or nurse to undergo the slight annoyance of a Schick test in order to have the information as to whether they are permanently immune or not. A person who has a negative Schick test is certain of immunity. A person who has a positive Schick test has always the possibility of diphtheria, although because of bactericidal substance in the blood as well as healthy mucous membranes, he or she may be immune at times.

WHAT IS TOXIN-ANTITOXIN AND WHAT IS TOXOID?

Diphtheria toxin is an extremely irritant and toxic substance. If an attempt is made to immunize animals or children with it, extreme care must be taken not to increase the beginning very small amount in subsequent injections until from six weeks to two months have passed, at which time appreciable antitoxin will have developed. It was found that if the toxin was modified by treating it with iodine or with formaldehyde, while its toxic strength had decreased greatly that its ability to neutralize antitoxin and to stimulate the production of antitoxin had changed very little. This altered toxin was called "toxoid." It was also found that the addition of an amount of antitoxin just insufficient to fully neutralize the toxin would result in a mixture which while only very slightly toxic was actively immunizing. This mixture is toxin-antitoxin. The mixture of toxin-antitoxin now utilized universally in this country was developed by me about four years ago. It contains about enough toxin to kill acutely four guinea-pigs. To this is added enough antitoxin to neutralize it to an extent that the whole injection causes slow death or paralysis of one guinea-pig. The antitoxin is usually taken from a horse, but it may equally well be taken from an immunized goat. The formaldehyde in the toxoid or the antitoxin in toxin-antitoxin have no part in the immunization. They simply modify the toxin so that more can be safely injected and not produce any local injury.

IS AN INJECTION OF TOXIN-ANTITOXIN EVER DANGEROUS?

In over 1,000,000 injections of toxin-antitoxin in New York State, no permanent harm to any child has ever resulted. During the past ten

years, however, in other cities three accidents have followed the administration of toxin-antitoxin or of supposed toxin-antitoxin. The first instance occurred in Dallas where, through a mix up of two preparations, a toxin-antitoxin mixture was used which had not been sufficiently neutralized. Several deaths occurred. Regulations were then made which will absolutely prevent this accident recurring. The second accident, which had less serious consequences, occurred in Boston. The contents of a number of vials of a special preparation used there were solidly frozen. Immediately after thawing, the toxin-antitoxin was injected into a number of children. The children who received it had both local and constitutional symptoms; all, however, recovered. Some of this material when tested was later found to contain free toxin. It is interesting to know that the new toxin-antitoxin, which we call the one-tenth L plus toxin-antitoxin, is not made harmful by freezing. The third accident happened a year ago in Vienna, which was at first stated to be due to the toxin-antitoxin having become toxic after it left the laboratory. This, I believe, is an impossibility. It was discovered after investigation that a number of vials of diluted toxin had been sent out with the toxin-antitoxin vials, and that some of these had been used by mistake for toxin-antitoxin, therefore it was these vials of toxin that caused the trouble. Beyond these accidents there is no death known to have occurred following the injections, and no annoyance beyond the soreness which develops in some subjects and lasts for two or three days.

THROUGH SENSITIZATION TO THE HORSE SERUM GLOBULIN IN THE TOXIN-ANTITOXIN, IS THERE ANY POSSIBILITY OF CHILDREN DEVELOPING ANAPHYLACTIC SYMPTOMS WHEN GIVEN LATER INJECTIONS OF HORSE SERUM?

Let us first consider the results following the larger injections of antitoxin used to give passive immunization. So far as immunizing injections of antitoxin are concerned, there is no question that there is a definite sensitization of those who are injected. There is, however, no evidence that this sensitization produces a change which makes later injections of the serum dangerous.

I have gathered together about thirty cases, in which injections were given some three weeks to six months after the immunizing antitoxin injections. There was an immediate reaction, with rash and elevation of temperature in several of these children. The rise of temperature in one child was 4 degrees, and in another was 2 degrees. These rises of temperature were quite transient, and in the course of four hours the temperature had returned nearly to normal. With the temperature elevation, there was a general urticarial rash which lasted for one or two days. This is what is called an accelerated reaction. The reaction in these children, besides being hastened, may have been somewhat more

severe, but there was no sign of danger and in fact within a few hours the children were absolutely in good condition except for the annoyance of the urticarial rash. So far as sensitization with toxin-antitoxin is concerned, we must remember that the amount of serum given is very small, and is equivalent to about $\frac{1}{3000}$ cc. of horse serum globulin as compared with 1 cc. in an immunizing injection of antitoxin.

Several years ago, Hooker showed that persons who had received toxin-antitoxin injections gave a higher percentage of positive skin reactions when tested one year later. In repeating his tests, I found that there was indeed a slight increase in the percentage of persons who gave a slight skin reaction. None of these reactions, however, were severe, such as occur in occasional cases with or without a previous history of toxin-antitoxin injections.

I have looked up the records of more than fifty persons who received therapeutic doses of antitoxin and who had toxin-antitoxin injections from one to three years previously, and compared them with an equal number of children who had never received these injections. The results of the comparison were very interesting. Practically the same number of the children reacted in those who had received and in those who had not received toxin-antitoxin. There were a few reactions in those who had received toxin-antitoxin which were a little worse than in those which had not received it. Whether this difference was due to the skin sensitization by toxin-antitoxin or to the natural susceptibility of the children is uncertain, but it probably is fair to consider it as due to the toxin-antitoxin. The difference, however, was so slight in amount that no one would think of withholding toxin-antitoxin because of it.

I am convinced that the cases described by Stewart of Minneapolis in the *Journal of the American Medical Association* were simply examples of ordinary severe serum sickness, which had little if anything to do with the previous injection of toxin-antitoxin. I have talked this matter over with Dr. Sears, and from his large experience he agrees with me that there was nothing whatever for physicians to worry about in the giving of toxin-antitoxin injections. However true this may be, there is a feeling about among some that it would be wise to change from toxin-horse-antitoxin to toxin-goat-antitoxin or to toxoid. I have used a preparation of toxoid made by Ramon of Paris with results as good as those obtained from the toxin-antitoxin, and now a large amount of toxoid with formaldehyde has been prepared according to the method described by Ramon. I intend to test this out very thoroughly, and if the results are equal to toxin-antitoxin, I shall probably make the change, but there is absolutely no reason to hurry and it is the idea not to make the change for at least another year. As a rule, toxin-antitoxin injections give slightly more reaction in the very young and less reaction in the older children and adults. This is due

to the fact that the very young children respond to the slightly under-neutralized toxin, while older children respond to the proteins in the toxoid. The toxoid is practically without toxic effect, but has about thirty times as much of the broth and culture proteins.

IF THEY HAVE POSITIVE REACTIONS TO THE SCHICK TEST, SHOULD PHYSICIANS AND NURSES BE GIVEN TOXIN-ANTITOXIN?

It certainly is wise for all nurses and physicians whose duties bring them in contact with diphtheria to take toxin-antitoxin if they give a positive Schick test and no marked reaction to the control protein test. Those who show no reaction from the control test can be pretty well assured that they will have little or no annoyance from the toxin-antitoxin. If, however, there should be a marked reaction in the control Schick test, there will probably be a severe reaction to the toxin-antitoxin or toxoid and it is probably not worth while to take the injections unless they are nurses in a general hospital or in a contagious disease hospital. In these cases the individual doses should be divided in half and an additional dose given.

WHEN SHOULD A SCHICK TEST BE MADE AFTER TOXIN-ANTITOXIN?

A retest stands in an entirely different position from the original Schick test. It shows whether the children have become immune or not. It is known that from 80 to 90 per cent develop immunity after the three injections, but without the retest it is impossible to know which are the fortunate ones. It is, therefore, of value to make a Schick test about three or four months after the attempted immunization. If it should be positive, another series of injections should be given. Few of the refractory children resist the second series of injections. If the Schick test is negative, there is no need to perform any later routine tests. Tests carried on for nine years show that 90 per cent of a group of susceptible children who became immune after the injections have remained immune for that time.

WHAT SHOULD BE DONE WITH AN UNPROTECTED CHILD EXPOSED TO DIPHTHERIA?

If the child is under 6 years of age, especially if the physician lives at a distance, it is wise to give immediately a subcutaneous injection of 1,000 units of diphtheria antitoxin. This, of course, will prevent the use of the Schick test. This amount of antitoxin will give an absolute immunity for ten days and a probable immunity for two weeks. It is wise to make a culture in order to protect other children if the child should have become a carrier through contact with a case.

If for any reason it is thought best not to give antitoxin unless symptoms suspicious of diphtheria occur, a culture should be made from the

throat and nose and a Schick test should be made. It is also well from time to time for the child's nose and throat to be douched with a mild nonirritating antiseptic cleansing solution. In older children also, if the exposure has been great, I believe it is wise to give an immunizing dose of antitoxin.

WHAT SHOULD BE DONE WITH A CHILD WHO HAS RECEIVED TOXIN-ANTITOXIN INJECTIONS, OR WHO HAS BEEN SHOWN TO BE IMMUNE BY THE SCHICK TEST?

If a Schick test has been recently done, there is no need of giving antitoxin even though the contact has been close. Here another Schick test should be done, to add to the certainty of the correctness of the first one. A culture should be made to prevent the possibility of the child from infecting others if it should have become a carrier through contact. If the child should develop a suspicious sore throat, it should then receive antitoxin even though the probability of the condition being diphtheria is very slight. There is no serious objection to giving the child an unnecessary dose of antitoxin, and it is known that serious harm may ensue if the child develops diphtheria and an early dose of antitoxin is not given. I also know there are slips with the Schick test.

CONCLUSION

In conclusion, let me emphasize that the use of toxin-antitoxin has not yet become so general that one can cease to watch children for the first signs of suspected diphtheria, so that antitoxin can be given on the first day of sickness (when it does its most perfect work), and if not then at least as early as possible, for every added hour of disease lessens somewhat the effectiveness of the antitoxin.

The value of antitoxin is chiefly in the treatment of developed cases of diphtheria and to a less extent in the immunization, for a short period, of those directly exposed to a case. The value of toxin-antitoxin or of toxoid is in the lasting immunization of those injected.

The use of antitoxin reduced the death rate from diphtheria in New York City from about 150 per 100,000 in 1894 to about 23 in 1911. The use of toxin-antitoxin has been largely instrumental in further lowering the death rate since 1919 to about 8 and in cutting down the yearly cases from about 15,000 to about 7,000.

Reports from New York State and from other states tell the same story of the lessening of the death rate by the early use of antitoxin and of the morbidity rate by the immunization with toxin-antitoxin or its equivalent toxoid. Such results should make physicians enthusiastic to do their part toward safeguarding their younger patients from diphtheria, and thereby safeguard the other children of the community in which their patients live.

RESULTS OF DIPHTHERIA IMMUNIZATION IN CENTRAL NEW YORK*

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Quarantine, isolation and terminal disinfection methods for the control of diphtheria, together with a thorough knowledge of its etiology, diagnosis and mode of transmission, have not lessened the prevalence of this disease. Thirty years' experience with a specific diphtheria antitoxin for its treatment and for the purpose of securing passive immunity has not lowered the death rate from diphtheria to the extent that it should.

Three important factors are undoubtedly responsible for this failure: First, too much reliance on the laboratory diagnosis with the consequent failure to give antitoxin on the receipt of a negative report. Second, the failure to give antitoxin in clinical cases without waiting for a laboratory diagnosis. Third, the delay on the part of parents and guardians in calling a physician during the early manifestations of the disease, and frequently their opposition to the administration of antitoxin until the child is in a practically hopeless condition.

ERADICATION OF DISEASE

The eradication of any communicable disease must depend to a large extent on the securing of an active immunity among a large percentage of the susceptible population. By means of isolation and quarantine, a temporary postponement of infection may be secured and thereby the attack may be deferred to a more favorable age period, but no great progress will be made by these methods in the elimination of the disease.

It is a well-known fact that in most of the communicable diseases one attack secures immunity from a subsequent attack for a longer or shorter period of time. It has been the aim of scientific physicians to find some means by which immunity may be secured without the sickness and deaths which so frequently occur when immunity is acquired by nature's methods. Our only hope in the eradication of diphtheria is through active artificial immunization.

METHODS

All methods for the control of smallpox were absolute failures until the advent of artificial immunization through vaccination. Typhoid

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fever, especially in our armies, raged unchecked until temporary immunization could be secured through antityphoid inoculations. Tetanus was the bane of the army surgeon until its prevention could be secured through the use of tetanus antitoxin, and so in diphtheria, while physicians were able to lower the mortality and to protect in large measure the individual by the use of antitoxin, the incidence of the disease was little effected. Not until the announcement of the Schick test for ascertaining the susceptibility of the subject to diphtheria, and toxin-antitoxin for immunization against the disease, were the prospects of its eradication made possible.

Through the work of Dr. William H. Park of New York City and his co-workers, a toxin-antitoxin mixture has been perfected whereby one can secure a large percentage of immunity among children with no risk and with practically no discomfort to the individual.

Theoretically, 100 per cent immunization among children should be secured in order to eradicate diphtheria. From a public health standpoint, however, the disease can practically be controlled by securing the immunization of a relatively high percentage of school and preschool children. All parents should, however, realize that they should have their children protected, as it is unsafe to depend on high percentage immunization for their individual protection. The immunity on the high percentage basis has been strikingly shown in the work of the past five years in the central New York district.

IMMUNITY IN NEW YORK STATE

This district comprises four counties, including one second class and two third class cities, thirty-nine incorporated villages and a large rural population representing a total population of about 400,000. In fifteen of the incorporated villages in which immunization of 50 per cent, or more, of the school children has been secured, there has been a most striking decrease in the diphtheria incidence, and few or no deaths during the past two years. In two of these villages, each having a population of more than 6,000 people, there has not been a case of diphtheria reported in more than a year and a half. All of the cities, nearly all of the incorporated villages and a considerable part of the rural population have been included in this work. The diphtheria death rate in this district for 1925 was 2.9 per hundred thousand, as compared to 7.8 per hundred thousand for the remainder of the state exclusive of New York City.

In the city of Auburn, where immunization of the highest percentage of school and preschool children has been secured, the results have been so striking that I shall give them in greater detail.

As I have stated in previous papers on this subject, the city of Auburn has a population of about 37,000, representing thirty-one nationalities, varied industries and all kinds of home conditions.

During the previous decade, diphtheria had become increasingly prevalent, the death rate from this disease having reached as high as 48.3 per hundred thousand in the year 1920, and nearly as high in the year 1921 with a correspondingly larger number of cases. School attendance was seriously interrupted in consequence, which in the fall of 1921 had reached an alarming condition, partly due to the fact that a very large number of the school children had become virulent diphtheria carriers. Having demonstrated the value of immunization by completely eliminating diphtheria in the orphans' home in that city the previous year, it was decided to begin an intensive campaign for the purpose of securing immunization of as high a percentage of the school population as was possible.

After the possibilities had been discussed with the local health officer, the physicians of the city, the school authorities and others, and good publicity had been obtained through the press, the work of immunization was begun on Feb. 9, 1922. Between that date and March 17, the Schick test was performed on 58 per cent of the school children with positive reactions from whose parents written consent had been obtained; these children had also been immunized.

By keeping an accurate card index record at the local laboratory of the name of the child and the dates of the test and immunization, it was possible to check the results of immunization by using the non-immunized children as a control check. At the end of one year, that is, from March 17, 1922, to March 17, 1923, seventy-eight cases of diphtheria occurred, resulting in thirteen deaths among the 42 per cent from whose parents consent had not been received, and in five reported cases and no deaths among the 58 per cent who had been treated or who had shown a negative Schick test. One of the five cases occurred too soon after treatment for immunization to have taken place, and the other four proved to be nondiphtheritic throat conditions in children who were diphtheria carriers.

In the spring of 1923, the immunization of an additional number was secured, increasing the percentage of immunized children to 73, and leaving only 27 per cent in the non-immunized group.

During that year fifteen cases of diphtheria occurred, resulting in one death among the 27 per cent not immunized, and in two doubtful cases and one death in the 73 per cent treated group. The one death, the only one which has occurred in Auburn among children who either gave a negative Schick reaction, or who have received toxin-antitoxin, I will refer to later.

By the spring of 1924, the immunization had been secured of about 85 per cent of the school population, and of a considerable number of the children under school age. Since that time, now two years and two months, there has not been a death from diphtheria in the city of Auburn. The last death occurred on March 9, 1924, in a non-immunized child, aged 2 years, and the one prior to that occurred on July 21, 1923.

Having secured this high precentage of immunization among school children, this work has since been confined entirely to the preschool child and to school children of the kindergarten grade. Among this group the preliminary Schick test has been given up entirely; this test has been reserved until six or ten months later to ascertain whether or not immunization has been secured in each child treated.

The work has since continued fall and spring, and an intensive campaign is now in operation for the purpose of securing the immunization of as many as possible of the children between the ages of 6 months and 5 years.

During all of this work no child has had a serious reaction or an infected arm. When using the 3 L mixture, occasionally a rather severe reaction occurred, lasting from twenty-four to thirty-six hours. This was particularly noticeable in children who had just previously recovered from a severe illness, such as scarlet fever or other acute diseases. No such reaction has been seen since using Dr. Park's 0.1 L mixture.

REASONS FOR IMMUNIZING

There are three good reasons why these efforts should be largely exerted toward immunization of the preschool children: First, it is among children of this age that from 60 to 70 per cent of the deaths from diphtheria occur. Second, immunity by the use of toxin-antitoxin is much more readily secured, as shown by the subsequent Schick test among children of this age. Third, it is among children of this age that the least disturbance is obtained from the use of toxin-antitoxin, as they have practically no protein sensitization. There is, however, no doubt but that this work among the school children in Auburn was the principal educational factor by which so large a number of the preschool children was secured for immunization, and it was also a great factor in reducing the incidence of the disease in the latter group from decreased contact infection.

THE SCHICK TEST

The Schick test is a most valuable and dependable procedure for ascertaining a subject's susceptibility to diphtheria when the test is accurately performed with a standardized toxin dilution. The test should be carefully read, and the subject always should be given the

benefit of the doubt. Its value as a preliminary test has been a matter of much discussion of late. I believe its use as a preliminary test depends on racial and environmental conditions. It has been given up entirely for children in rural communities regardless of their age; also in sections of cities in which there are children whose parents are of the English speaking races. The preliminary Schick test is still used among Polish and Italian school children, principally as a time and material saving measure. It has been found that among Polish children only 26 or 27 per cent are susceptible, while the percentage among the Italian children is about 36. For example, in one Polish school 633 children were given the preliminary Schick test, and only 190 of them gave positive reactions and therefore were in need of toxin-antitoxin treatment. I believe, however, that the Schick test should be given from six to ten months after the administration of toxin-antitoxin, in order to ascertain whether immunity has been established. Unless this is done the value of the treatment will be discredited, and lives may be lost through a sense of security from the supposed immunization. The subsequent Schick test among a large number of school children will show that from 10 to 15 per cent will give a skin test reaction varying from a brownish pigmentation to a more or less typical reaction. It is only among 2 or 3 per cent that the bright typical reactions are obtained. In the younger children, a much higher percentage of immunity is obtained. Experience leads me to believe that the brown pigmented reactors are immune to an ordinary exposure to diphtheria, but those showing bright typical reactions should receive a second series of toxin-antitoxin treatments. And in rare instances it is found necessary to give even a third series before a negative Schick test can be secured. The resistance to the immunizing effect of toxin-antitoxin appears to be a family characteristic. The importance of the subsequent Schick test was brought forcibly to my attention in the early part of this campaign by the death of the child to whom I have already referred and who had received toxin-antitoxin. This boy, aged 12 years, was given the Schick test in February, 1922; he showed a positive test, was immediately given toxin-antitoxin, was retested eight months later and again showed a bright positive Schick test. He was not given a second series of toxin-antitoxin injections. A few months later he contracted what was diagnosed clinically and bacteriologically as diphtheria. In spite of the fact that he was given 30,000 units of diphtheria antitoxin intravenously within thirty-six hours of the onset of the disease, he died five days later from symptoms of general septicemia. Some question was raised as to whether he might have been suffering from a streptococcus sore throat, and also whether at the time he was a diphtheria bacillus carrier. Since that time it has been the practice to follow up immediately all such positive subsequent Schick tests with a second series of toxin-antitoxin treatments.

The question is often raised as to who should be responsible for the administration of toxin-antitoxin. If every practicing physician would either immunize with toxin-antitoxin or be responsible for the immunization of all children between the ages of 6 months and 5 years in the families under his care, the problem would be solved. Before this can be brought about, however, the value of the toxin-antitoxin immunization must be thoroughly demonstrated in every community.

PUBLIC HEALTH DEPARTMENT WORK

The major part of this work of education must be conducted by public health departments in such a manner as will best secure the cooperation of physicians, and will encourage them to take over this work. False and misleading statements which have frequently been published are doing much to discourage this work among physicians. Warnings as to the dangers of sensitization of subjects to the subsequent administration of antitoxin and other horse serum products by those whose study of anaphylaxis has been to a large extent confined to laboratory experiments with guinea-pigs and other animals, and who have not had a large practical experience with toxin-antitoxin administration to children, are in a large measure responsible for the failure of physicians to take over this work. In no case have I seen the slightest evidence that such sensitization has taken place. Children who have received toxin-antitoxin and who have subsequently developed Vincent's angina or other nondiphtheritic throat diseases have received large doses of diphtheria antitoxin without the slightest evidence of allergic manifestations, except occasionally a mild serum sickness. In one such case, 24,000 units of antitoxin was given intravenously to a child who had previously received toxin-antitoxin. Among immunized children who have become diphtheria contacts, and who on that account were given prophylactic doses of antitoxin, none have shown any disturbance whatever. On the other hand, 100 children in an institution who, while suffering from diphtheria had received large doses of antitoxin, were three months later given the Schick test; nearly all showing a positive reaction were given toxin-antitoxin, and in only one case was there any evidence of serum sickness and that only a transient urticaria.

There is no analogy between the experimental anaphylaxis in guinea-pigs and the anaphylaxis which occurs in man from the use of horse serum. All authorities agree that practically all anaphylactic deaths which have occurred from the injection of horse serum products have been from the first dose. In Syracuse during the past thirty years, I have known of but two deaths from anaphylactic shock following the administration of horse serum products. Both were asthmatic subjects; in both instances it was the first dose given, and in both instances it was an immunizing rather than a therapeutic dose. Rosenau calls attention

to the fact that anaphylactic shock rarely, if ever, occurs from diphtheria antitoxin if the individual to whom it is given is suffering at the time from an attack of diphtheria. It is of importance for physicians to remember not to administer full doses of antitoxin to children who have a history of asthma without previously desensitizing them. Asthmatic children, however, should be immunized with toxin-antitoxin in order that they may not contract diphtheria, which would require the administration of antitoxin.

The failure or delay in giving antitoxin through fear of anaphylactic shock has undoubtedly resulted in a hundred-fold more deaths than have resulted from anaphylactic shock due to the administration of antitoxins. As Park has pointed out, there may be a slight increase in skin sensitization due to toxin-antitoxin, but never to such an extent as to interfere seriously with immunization.

COMMENT

The question is often asked: "Does one attack of diphtheria render an individual immune from subsequent attacks?" My experience is that it does not, especially if antitoxin has been given early in the disease. I had an opportunity to test this point in an institution which had an outbreak of diphtheria in September 1924. In December of that year, seventeen boys who were among those most severely ill, all gave a positive Schick reaction. Fifteen of these boys were given a series of toxin-antitoxin treatments in the following month. I again gave the seventeen boys the Schick test ten months later, and of the fifteen who had received toxin-antitoxin, fourteen gave a negative test and one was still positive. The two who did not receive toxin-antitoxin still gave a positive Schick test.

The permanency of immunization produced by toxin-antitoxin cannot be settled until a sufficient time has elapsed to demonstrate this point. All of the children who still remain in the Auburn Orphans' Home and who were tested and immunized in April, 1921, are still immune, as shown by a recent Schick test.

Obituary

HENRY I. BOWDITCH, M.D.

1874-1926

Dr. Henry Ingersoll Bowditch, sometime instructor in pediatrics, Harvard Medical School, and chief of the Boston Floating Hospital, died on June 8, 1926. He was born in Albany, N. Y., Nov. 18, 1874, the son of Edward B. Bowditch, and the nephew of Prof. Vincent Y. Bowditch. He was educated at Groton School; he received a degree of A. B. from Harvard University in 1898 and the degree of M. D. from the Harvard Medical School in 1902. Dr. Bowditch then served as a house officer at the Boston City Hospital and the Boston Children's Hospital, and commenced the practice of pediatrics in 1905. He served as an instructor in the Harvard Medical School for many years, teaching both at the Boston City Hospital and the Boston Floating Hospital where he was a member of the visiting staffs. He was a member of the American Pediatric Society.

In the first years of his practice he assisted John Lovett Morse. Throughout his medical career, his main interest was centered in the Boston Floating Hospital, to which he gave extended time and enthusiasm; it was mainly through his efforts that the hospital reached its present state of efficiency and was enlarged so that it had an "on-shore" hospital which could care for the children during the winter months when the boat was not in commission. There he developed a laboratory where an intensive study was made of whooping cough and the development of the roentgen-ray treatment of this disease. He always took an active interest in the social welfare of his patients.

He married Miss Eleanor Pratt McQueen of Washington, D. C., in 1910 and had five children. His life was a particularly happy one on account of his lovable character and his faculty of making many friends. The personal interest that he took in their well-being and the friendly interest that he took in all the affairs of his patients make his loss even greater to every one with whom he came in contact. He was an Episcopalian and deeply religious, and took an active part in church affairs.

F. B. T.

News and Comment

A NEW MAGAZINE

"Children, the Magazine for Parents" made its initial appearance with the October issue. The editorial board is composed of many persons of national and international reputation, and the magazine should be of much service and altogether reliable.

Abstracts from Current Literature

Anatomy and Physiology

EFFECT OF EXERCISE ON THE CIRCULATION, SUGAR METABOLISM AND OTHER FACTORS. BURGESS GORDON, Northwest Med. **25**:376 (July) 1926.

Gordon recounts some studies on marathon runners made in the years 1923, 1924 and 1925. Roentgenograms made immediately after the races showed that the runners' hearts had diminished in size, but returned to normal in a day. One runner whose heart showed extrasystoles before a race did not show them afterward. Another with a systolic murmur did not have this after the race. The vital capacity of the lungs was 17 per cent less than before the race. At the end of the run, the blood sugar was diminished in six of nine runners; the greater the hypoglycemia, the greater the appearance of symptoms similar to those of insulin shock. At another race at which the runners were fed sugar during the race, they showed no hypoglycemia, and were improved in wind and speed. No changes were found as a result of continued indulgence in this sport, except that there was some increase of the hilum and bronchial shadows. Hypertrophy of the myocardium recognizable by the roentgen ray has not been seen. Long distance runners do not physiologically crave sugar or any other dietary element, their diets being varied and selected through the advice of trainers.

SCOTT, Philadelphia.

RELATIONSHIP OF THE THYMUS AND TESTES TO GROWTH. NOËL PATON, Edinburgh M. J. **33**:351 (June) 1926.

It has been found by animal experimentation that the removal of the testes causes a persistence of the thymus, and the removal of the suprarenals, especially if the testes be included, results in a regeneration of the involuted thymus. This fact, demonstrated by several workers, supports the conclusion of Paton that there is a reciprocal relation of the testes and thymus to body development. Earlier, he showed the effect of thymusectomy in producing an increased rate of growth of the testes before sexual maturity. In this paper he analyzes the data from children's hospitals secured from their pathologists. He plots the curve of the weights of thymus and testes in 185 children, whose ages varied from 2 days to 17 years, on the thymus chart of Hammar (relation of body growth to recession of thymus). Both in the guinea-pigs and in boys the thymus and testes increase during a certain period. In boys, this occurs between 10 and 15 years of age, and is the time of rapid prepubertal growth. In young guinea-pigs, under 300 Gm. weight, after the thymus and testes have been removed the body growth is definitely retarded. The evidence indicates, according to Paton, that before puberty the thymus influences growth, but if the thymus atrophies and the testes develop, growth is maintained. Usually the action of these two glands is balanced. In animals, the removal of one and the increased function of the other causes compensation.

CLEFT STERNUM AND ECTOPIA CORDIS. DAVID M. GREIG, Edinburgh M. J. **33**: 480 (Aug.) 1926.

To all physicians or anatomists who have ever seen the extraordinary occurrence of a congenital cleft sternum and ectopia of the heart, this paper will be

of interest and value. The writer begins with the narration of a case in an infant who lived thirteen months. Grieg considers the embryology of these defects and gives an historic summary of the cases in the literature. Simple cleft sternum occurred in several persons, some of whom lived to adult and middle life. This defect of the sternum also occurs more frequently with ectopia cordis, and with one exception in the reported cases, the extrusion of the heart was thoracic. The infants with these associated abnormalities live for only a few hours or days. Not only human beings but animals may have these defects. Ectopia cordis may exist without defect of the sternum, and the heart may be located in the neck or in the abdominal cavity, and especially in ventral hernias. Cases from the literature are discussed. The abnormal positions of the heart, the abnormalities in the pericardium, and the malformation of the heart and great vessels are of more importance in ectopia than is the cleft in the sternum.

NEFF, Kansas City.

Pathology, Bacteriology and Biochemistry

THE REACTION OF COW'S MILK TO BLOOD SERUM PRECIPITIN. F. S. JONES, J. Exper. Med. **43**:451, 1926.

Rabbits were immunized with cow serum until a high titered precipitin was obtained. When normal cow's milk was tested with amounts of such precipitin sufficient to detect $\frac{1}{40,960}$ cc. of cow serum, it reacted with regularity in dilution of 1:80 and in nearly every instance in dilution of 1:160.

It was found that milk drawn from normal udders will react in rather definite dilutions to a definite amount of serum precipitin, and that the end-point is not greatly influenced by the presence or absence of the usual udder bacteria. Milk withdrawn at the end of milking is not richer in blood protein than that withdrawn at the beginning. Udder fluid just before parturition is rich in serum proteins which diminish rapidly after parturition, as soon as the udder is regularly emptied, and then fall gradually to a normal level. With mastititis there is an increase in the blood serum content of the milk from the affected quarter. Addition of even as little as $\frac{1}{80}$ part of milk from a severely involved quarter to bottled milk will increase the serum titer 4 to 8 fold, thus indicating that the test would be of importance in detecting addition of milk from cows with mastitis to herd milk.

Milk heated at 65 to 66 C. for twenty minutes still reacts to the precipitin test as well as raw milk, but if the temperature is increased from 68 to 69 C. for the same period, the milk ceases to react. The precipitin test, therefore, may be used to determine whether milk has been heated above 68 to 69 C.

MCCLURE, Evanston, Ill.

STUDIES ON THE EFFECT OF CERTAIN TOXIC SUBSTANCES IN BACTERIAL CULTURES ON THE MOVEMENT OF THE INTESTINES. I. THE EFFECT OF SOLUBLE TOXIC SUBSTANCES OF YOUNG CULTURES OF BACILLUS PARATYPHOSUS B. E. E. ECKER and A. RADEMAEKERS, J. Exper. Med. **43**:785, 1926.

Following intravenous injection, filtrates of young cultures of *Bacillus paratyphosus B.* often produce marked diarrhea in rabbits. A study was made of the effect of these toxic filtrates on the motility of the small intestines of the rabbit. The observations were made on a segment of the small intestines in situ and in the living animal. It was found that an immediate slight rise of tone of

the longitudinal muscles occurred following intravenous injection of sterile broth. The same rise was noted after the injection of the toxic filtrate; but with these it was followed later (ten minutes elapsing, at least) by a strong but gradual rise of the diastolic and systolic tone, i. e., by spasmodic contraction of the intestinal muscle, which persisted at times for as long as two hours. In order to record simultaneously the effect on the longitudinal and circular muscles and the propulsive efficiency of the segment the Sollmann and Rademaekers modification of Baur's technic was employed. This arrangement showed that the stimulation of the longitudinal muscles is accompanied by a similarly strong stimulation of the circular muscles, by peristalsis and, therefore, by a greatly increased propulsion of intestinal contents which was sufficient to overcome the inhibition that usually occurs after preparation of the animal. With this arrangement an instance of peristaltic spasm was also noted. Broth alone failed to produce the phenomenon. Isotonic magnesium chloride or sulphate added to the bath relaxed the muscles again. Animals under deep urethane anesthesia did not show the diarrhea which occurred in the intact controls, but sometimes exhibited it after the effect of the anesthetic had disappeared. So far no effects have been observed on the isolated strip (Magnus method), and further studies are being made to localize the effect, to neutralize it with a specific antiserum and to observe the effect of filtrates of other members of the bacterial group including the dysentery bacilli.

AUTHORS' SUMMARY.

THE CULTIVATION OF THE GRANULES OF VACCINIA VIRUS. E. C. CRACIUM and E. H. OPPENHEIMER, J. Exper. Med. **43**:815, 1926.

The technic is described whereby vaccinia "granules" are separated from all other material of glycerolated vaccinia calf lymph and cultivated in vitro with embryonic tissues.

These "granules" remain alive as tested by rabbit corneal inoculation for as long as seventy-one days, when grown in connection with growing tissue; they fail to remain potent if cultivated with dying cells, showing in this way the same characteristics as whole vaccine virus. The potency of the "granules" increases with the age of the culture under the first mentioned conditions.

The fluid part of the vaccinia lymph which remains after the removal of all "granules" is impotent under all conditions.

AUTHORS' SUMMARY.

THE HEAT PRODUCED BY REACTIONS OF ANTIGENS WITH ANTIBODIES. S. BAYNE-JONES, J. Immunol. **10**:663 (July) 1925.

Using the differential microcalorimeter of Hill, the author has found that the union of diphtheria toxin and antitoxin is exothermic, as is that of the agglutination of bacteria by immune serum. In the latter reaction heat is liberated in two periods, the first, during the combination of antigen and antibody, the second during flocculation.

IMMUNOLOGICAL STUDIES IN TUBERCULOSIS. III. CONCERNING ALLERGIC REACTIONS OBTAINED IN ANIMALS SENSITIZED WITH KILLED TUBERCLE BACILLI. S. A. PETROFF and F. W. STEWART, J. Immunol. **10**:677 (July) 1925.

In a small series of guinea-pigs, the allergic reactions in the skin, peritoneum, eye, pleura and testis, were the same in animals sensitized with killed bacilli as in these infected with living organisms.

ANTIGENIC CHARACTER OF HEATED PROTEIN. J. FURTH, J. Immunol. **10**:777 (Sept.) 1925.

Using heated and unheated serum and crystalline egg albumin as antigens, the author demonstrates by the precipitin reaction, by complement fixation, by Anthus phenomenon, by anaphylactic shock and the Dale technic, that a new specificity is produced by heat.

A STUDY OF THE AGGLUTINATION REACTIONS OF THE DIPHTHERIA GROUP OF ORGANISMS. G. H. BAILEY, J. Immunol. **10**:791 (Sept.) 1925.

The agglutination reactions of nontoxin producing strains of diphtheria bacilli indicated a general group relationship among these organisms, but no relationship to virulent diphtheria bacilli, *B. hofmanni* or *B. xerosis*.

NATURAL AUTO AND HOMO SPERMOTOXIN IN GUINEA-PIG SERUM. L. S. N. WALSH, J. Immunol. **10**:803 (Sept.) 1925.

These spermotoxins were found by the author in the serum of both male and female animals of several species. The toxic action depends on the concentration of the serum. Dilute serum stimulates both motility and longevity of the spermatozoa, while concentrated serum is toxic.

SEROLOGICAL STUDIES ON BOVINE INFECTIOUS ABORTION. J. C. MCALPINE and L. F. RETTGER, J. Immunol. **10**:811 (Sept.) 1925.

The authors find that cows with agglutination and complement fixation tests positive to *B. abortus* may be divided into three groups: (1) Those whose serum reacts to a high titer and whose udder secretions constantly exhibit both reacting antibodies; (2) those whose serum titers are lower and whose milk contains antibodies only during the colostral and drying off periods; (3) those whose serum titers are still lower and whose milk contains no antibodies. They find that the serum of all new-born calves is negative, but that if they ingest positive colostrum during the first twenty-four hours, the serum becomes positive, but again becomes negative before the sixth month of age. If they ingest negative colostrum, however, the serum remains negative.

STUDIES IN SPECIFIC HYPERSENSITIVENESS. XVIII. AN INDIRECT METHOD OF TESTING FOR CONDITIONS OF ATOPIC HYPERSENSITIVENESS (A PRELIMINARY REPORT). M. WELZER and S. D. KRAMER, J. Immunol. **10**:835 (Sept.) 1925.

The authors use transferred local passive hypersensitiveness to test for the specific atopic reagin in infants. They inject the infant's citrated serum into the skin of a nonsensitive subject, usually a parent, and test the various passively sensitized sites twenty-four hours later with suspected atopens. The results in this small preliminary series were satisfactory, and further work is being done. As it involves merely one vena puncture of the infant, with subsequent intracutaneous injections into the adult passive agent, it promises to simplify considerably the difficulties of testing infants for atopic hypersensitiveness.

GUY, Peking.

EXPERIMENTS ON THE SENSITIVITY OF THE HUMAN SKIN TO THE TOXIN OF THE BACILLUS OF SHIGA-KRUSE. H. BROKMAN and F. PRZESMYCKI, J. Immunol. **11**:361, 1926.

Experiments are presented showing that the negative skin reaction to the products of the Shiga-Kruse bacillus in human beings depends on the presence

of antitoxin in the blood. The antitoxin is specific and, as in the case of "natural" immunity to diphtheria, it appears spontaneously in the individual, without a previous attack of the disease or artificial immunization. If this presence of dysenteric antitoxin in human beings provides an actual immunity against infection with dysentery, then the way must be open to attempt an active immunity in the same way as is done in respect to diphtheria and scarlet fever. We have actually begun to make this attempt with dysentery anatoxin. These experiments will be the subject of our next communication.

AUTHORS' SUMMARY.

THE PRODUCTION OF EXPERIMENTAL ENDOCARDITIS WITH PNEUMOCOCCI AND STREPTOCOCCI IN IMMUNIZED ANIMALS. HEDLEY D. WRIGHT, J. Path. & Bact. **29**:5, 1926.

Mair (1923) found endocarditis in seven of ten rabbits which had received a series of injections of autolyzed pneumococci followed two months later by a series of gradually increasing doses of living pneumococci, some of which were highly virulent.

Wright immunized nineteen rabbits by intravenous injections of autolyzed broth cultures of pneumococci, each rabbit receiving twenty-eight injections over a three months period. Eleven animals survived this treatment. The antibody content of the serum was small. After a rest of three weeks seven animals were selected for treatment with living cultures of pneumococci. During five weeks the injections were gradually increased from 1 cc. to 5 cc. three times weekly. None of the rabbits developed endocarditis.

In another experiment, five rabbits in various stages of immunization were given intravenously 5 cc. of a twenty-four hour broth culture of living pneumococci on each of three successive days. One rabbit not previously immunized died of septicemia; two which showed low antibody content developed endocarditis, one an aortic lesion, the other a mitral lesion; another developed arthritis; one animal remained well.

Following this the author tried a similar experiment using eleven treated rabbits. None developed endocarditis.

In experiment 3 a more virulent strain of pneumococci was used—twelve animals were immunized over a period of three months, followed by a rest of eight weeks after which living cultures were injected as before. One rabbit developed endocarditis, two died of intercurrent infections, the others showed no lesions. Later, nine rabbits were treated with gradually increasing doses of living pneumococci without preliminary immunization, from twenty to thirty doses being given over a period of four months. None of the rabbits developed endocarditis.

Wright next tried injections of nonhemolytic streptococci, all the strains but one having been isolated from cases of subacute infective endocarditis. In all, twenty-two rabbits received each a single dose of 5 cc. intravenously of a twenty-four hour broth culture. One rabbit developed endocarditis of the mitral valve and died in seven days. Fifteen of the rabbits were then given repeated injections intravenously of 5 cc., some every second day, others weekly. Three animals developed endocarditis, in one case accompanied by arthritis. The author concludes that endocarditis may be produced by injections of pneumococci into immunized animals as shown by Mair and that it may also be produced by repetition of relatively innocuous doses of streptococci, but the occurrence seems to be fortuitous and unpredictable.

The lesions produced consisted of voluminous vegetations composed largely of thrombus with a cellular reaction of the acute type. No increase in fibrous tissue was noted.

There is evidence of marked antibody production by such animals which at the same time show a progressively increasing septicemia such as is found in subacute infective endocarditis in man.

E. M. HALL.

BIOCHEMISTRY OF THE MENINGOCOCCUS. M. DECLICH, Ann. d'ig. **36**:337-357, 1926.

Simple placenta-ascites agar is the best medium for the cultivation of the meningococcus. Synthetic mediums with amino-acids are very unsatisfactory. The fermentative medium of Von Lingelsheim is most suitable for the differentiation between the meningococci and the pseudomeningococci. To obtain a florid growth, the placenta ascites medium must have a fixed humidity and must be alkalinized exactly. To preserve the meningococci, the author recommends a vitaminized medium consisting of semifluid gelatin with ascitic fluid and beer ferments.

BEHAVIOR OF TYPHOID AGGLUTININS DURING PREGNANCY. NICOLA and DONATO, Ann. d'ig. **36**:359-368, 1926.

In pregnant women vaccinated for typhoid, the specific agglutinins were not found before delivery; they appeared during labor and after delivery. The opposite obtained in pregnant rabbits. Intercurrent diseases may change this phenomenon. The fetal immunity resulting from active immunization of the mother is not considered as an active but as a passive type, inferior to that of the mother. This proves that the fetus in intra-uterine life becomes biologically autonomous. In extra-uterine life the agglutinins rapidly disappear while those of the mother persist.

COMPLEMENT DEVIATION TEST OF JACOBSTAL AND THAT OF WASSERMANN. N. PIETRAVALLE, Ann. d'ig. **36**:369-385, 1926.

The Jacobstal reaction has the same limits of specificity as the Wassermann reaction. It is more sensitive than the Wassermann test in its relation to the chemical reaction of the serum examined and its property of developing alkali at 37 C. When there is excessive acidity of the serum, the Wassermann test is the more sensitive.

ZAMBARANO, Northville, Mich.

BACTERIOLOGIC INVESTIGATIONS OF THE INTESTINAL FLORA OF THE NURSLING. GERGORIO VIDAL JORDANA, Arch. españ. de pediat. **10**:385, 1926.

The author concludes that the intestinal flora of the nursling is fundamentally uniform and always the same. Any change from this normal state depends on the type of alimentation given.

The theory that exogenous infection is a cause of nutritional disorders in the infant is inadmissible. Endogenous infection is not a primary cause but may be a secondary factor. The primary cause of intestinal disorder is always intimately associated with the aliment used at the time.

A study of the intestinal flora yields valuable diagnostic information and serves as a guide for proper dietetic treatment. Proper modification of food may influence the bacterial flora and favor its change and return to the normal.

SCHLUTZ, Minneapolis.

NEED OF CAREFUL TECHNIC IN BLOOD GROUP TESTS. P. BADINO, Policlinico **33**:433, 1926.

Badino found panagglutinins in the plasma (obtained by addition of anticoagulants) and to a less degree in the serum which separated at the temperature of 16 or 37 C. The latter specimens agglutinated every blood, including their own, sometimes even at 16 C. He concludes that careful work — especially when the test cannot be made under exact thermal conditions — requires the use of test serums which separated from blood kept in the icebox for two hours. The panagglutinins are absorbed by the coagulum in this case.

[ARCH. PATH.]

MUTATION FORMS OF DYSENTERY BACILLI SHIGA-KRUSE. M. JSABOLINSKY and W. GITOWITSCH, Centralbl. f. Bakteriol., O., I. **97**:148, 1926.

Variations occur. These variations may be closer to the typhoid bacilli or to the colon bacilli. It is a question of adaptation. Some of the variants lost their agglutinating character in a high dilution of the specific serum.

E. E. ECKER.

CONCERNING PHLORHIZIN GLYCOSURIA. BELA STEINER and RELLA BECK, Jahrb. f. Kinderh. **109**:21, 1925.

Mering's original explanation that phlorhizin glycosuria was due to the direct action of the drug on the kidney, and that the accompanying hypoglycemia was due to the glycosuria, has been brought into question by the observations of several investigators. Functions of the liver and the thyroid seem to have an influence on the results obtained by phlorhizin injection. The practicability of phlorhizin in kidney function tests is further questioned by the fact that at times glycosuria was not produced by its injection, even when the kidneys were proved to be normal.

The authors investigated the effect of phlorhizin injections on ninety children, and from their tabulated results made these conclusions: First, phlorhizin action is not confined to its effect on the kidney; second, after injection of phlorhizin hyperglycemia instead of hypoglycemia was produced in 30 per cent of their cases, and third, the changes in the blood sugar were independent of the degree or duration of the glycosuria. These facts bring up again the question of the mobilization of sugar in the body and the factors concerned. Whether phlorhizin affects tissue permeability was investigated by analyzing simultaneously the contents of artificially produced vesicles and the blood for their sugar content after injection of phlorhizin. From these studies, the authors feel that the tissues themselves are influenced by the drug.

PARMELEE, Chicago.

EFFECT OF TONSIL AND ADENOID EXTRACTS. PRELIMINARY REPORT. V. RUSS and E. SUCHANEK, Wien. klin. Wchnschr. **39**:883 (July 29) 1926.

Extracts were made from hypertrophied human tonsils and from adenoid tissue directly after operative removal. From 1 to 2 cc. of the solutions, when injected intravenously into rabbits, caused death after a brief period of dyspnea and progressive respiratory failure. Dilatation of the right ventricle and relative incoagulability of the heart blood were the sole pathologic changes. With sublethal doses of the extracts the animals survived; study of the blood before and after injection showed a marked decrease in leukocyte content and per-

centage of polymorphonuclear cells, followed five hours after injection by a relative polynucleosis. The lymphocytes at first increased, then dropped in five hours from 65 to 20 per cent. Platelets vanished completely from the blood for a period of several hours. Control injections with extracts of muscle, lymph gland, goiter tissue and blood clot gave essentially negative results. Placental tissue behaved similarly to tonsil and adenoid extracts. No conclusions are offered.

OLMSTED, Seattle.

A SIMPLE METHOD FOR DIFFERENTIATION OF MYELOID AND LYMPHOID LEUKOCYTES OF HUMAN BLOOD. A NEW PEROXIDASE REACTION (COPPER METHOD). AKIRA SATO and SOTOKICHI SEKIYA, Tohoku J. Exper. Med. **7**:111, 1926.

A new peroxidase stain is described using: solution A, copper sulphate 0.5 per cent; solution B, 0.2 Gm. of benzidine (P-diamino-diphenyl) rubbed with a few drops of water in a mortar, then 200 cc. of water added at room temperature and filtered, and to the filtrate 4 drops of a 3 per cent solution of hydrogen peroxide added; solution C, the counter stain, of neutral red, carbolfuchsin (1 part in 5) or safranin, aqueous solution 1 per cent, which is the best. Apply solution A to a fresh blood smear. Pour off most of it and apply solution B for two minutes and wash thoroughly with water. For counter staining do not pour off the peroxidase stain, but add solution C at once, let stand two minutes and wash, or apply 1 drop of safranin, aqueous solution 0.05 per cent, to a cover slip, put it on the peroxidase stained smear and examine at once.

The copper sulphate, both of whose ions aid the blue color of the myeloid granules which contrasts clearly with the light brown erythrocytes and the pale cytoplasm of the lymphocytes, also makes previous fixation unnecessary. It is claimed that the myeloid cells in blood from epidemic encephalitis are negative with this peroxidase stain although still positive with the Winkler-Schulze oxidase stain. Since this negative change does not occur in influenzal, tuberculous or acute meningitis or epidemic poliomyelitis the conclusion is that this test can be used in the differential diagnosis and prognosis of acute epidemic encephalitis, the length of staining time necessary to return to a positive reaction being in direct proportion to the gravity of the disease.

ETHEL B. PERRY.

COLORIMETRIC METHOD FOR THE DETERMINATION OF INORGANIC SULPHATES IN URINE, BLOOD AND MILK. SHUN-ICHI YOSHIMATSU, Tohoku J. Exper. Med. **7**:119, 1926.

After the removal of the protein from urine, blood and milk, by the use of alum cream, the sulphates were precipitated with benzidine hydrochloride, dissolved in an iodine, potassium iodide and ammonia mixture, and calculations made from colorimeter readings. Figures from other authors are given for comparison. The inorganic sulphate of breast milk was found to be from 0.6 to 1.9 mg. per hundred cubic centimeters.

[ARCH. PATH.]

Nutrition

THE RÔLE OF DENTITION IN THE DIAGNOSIS OF RICKETS. JULIUS BLUM and JACOB MELLION, J. A. M. A. **86**:677 (March 6) 1926.

A review of the literature as to the rôle of dentition in the diagnosis of rickets reveals merely general statements and a striking paucity of data. A study of mild rickets by clinical, roentgenologic, and chemical methods showed

that dentition is delayed even in this group of cases. Owing to the variability in the time of eruption of the deciduous teeth, delayed dentition is not of much value in the diagnosis of rickets.

BONAR, Salt Lake City.

HEMOLYTIC STREPTOCOCCI OF THE BETA TYPE IN CERTIFIED MILK. HOWARD J. BROWN, W. D. FROST and MYRTLE SHAW, J. Infect. Dis. **38**:381, 1926.

Beta hemolytic streptococci in considerable numbers were found in the certified milk of five dairy herds. These streptococci belonged to several distinct cultural and serologic groups. There is no evidence that any of them, whether from gargety cows or from mixed milk, are pathogenic for human beings. The causative organism of milk-borne septic sore throat is *Streptococcus epidemicus.* This streptococcus is probably of human origin but occasionally may gain entrance to the udder of a cow and find its way into the milk supply. The hemolytic streptococci commonly found in milk show distinct cultural and biologic differences from *Streptococcus epidemicus.* No single test, however, can be relied on to differentiate them. All the tests are of value. A few bovine strains may possess capsules. Many produce rapid hemolysis of blood cells in fluid mediums. A considerable number are markedly pathogenic for mice. Many ferment the same sugars as the human strains. A few produce about the same final hydrogen ion concentration in glucose broth as do the human strains and a few resemble the latter in producing little or no hydrolysis of sodium hippurate. The latter two tests, however, are probably the most constant and reliable of those tried.

A routine procedure for the detection of *Streptococcus epidemicus* in milk may be outlined as follows:

Milk should be inoculated into poured blood-agar plates.

Capsules should be looked for in moist india ink preparations from young moist surface colonies.

Deep colonies with beta zones of hemolysis are to be fished into serum broth. To save time fishings from the same colonies may be made into glucose broth and into sodium hippurate broth.

Tests may be made with the broth culture as follows: (*a*) A hemolysin test is made by adding 0.5 cc. of a 5 per cent suspension of washed rabbit blood corpuscles to 0.5 cc. of broth culture, and taking care not to contaminate the broth culture so that it may be used for subsequent tests. Cultures producing little or no hemolysis in two hours at 37 C. may be discarded and subsequent tests omitted. (*b*) A stock culture is made on a blood-agar slant. Capsules should be looked for again after incubation over night. (*c*) Sodium hippurate broth is inoculated if it has not already been inoculated directly from the colony. By means of the ferric chloride test hydrolysis of sodium hippurate may be detected in from twenty-four to forty-eight hours. (*d*) Glucose broth is inoculated if it has not already been inoculated directly from the colony. The final hydrogen ion concentration should be determined in not less than forty-eight hours. (*e*) Salicin and mannite broths are inoculated. Saccharose, lactose and raffinose have seldom been found of value for this differentiation. (*f*) Mice are inoculated, although this test has been found less significant than the others.

To justify condemnation of the milk the streptococcus found should correspond in all respects with the characters of *Streptococcus epidemicus.*

AUTHORS' SUMMARY.

THE PRODUCTION OF CERTIFIED MILK. SIR ROBERT PHILIP and J. C. SIMPSON, Edinburgh M. J. **33**:118 (March) 1926.

This short article deals with the general rules for the production of certified milk as employed in Scotland. Forty per cent of all milk cows in that country are infected with tuberculosis, so that animals must be secured from a tubercle-free herd, and tests made every six months. As regards the general bacterial content required by the Board of Health, the writers say that it is easy to keep below the maximal limit of 30,000. The counts at Gracemount Farm, made twenty-four hours after milking, run from 600 to 1,200 per cubic centimeter, and the organisms consist of the lactic group which are normally found in the cow's udder.

NEFF, Kansas City, Mo.

THE SIGNIFICANCE OF COWS' MILK WHEY FOR THE GENESIS OF ACUTE DIARRHEAL DISTURBANCES IN BABIES. SEVENTH COMMUNICATION — WHEY AND DURATION OF STAY IN THE STOMACH. W. BLOCK and E. KOENIGSBERGER, Ztschr. f. Kinderh. **40**:272, 1926.

The fourth approach is by the consideration of the effect on sugar absorption by duration of stay in the stomach. Although whey in the presence of casein does prolong the duration of stay, sugar absorption in the intestines and the duration of the stay in the stomach are independent.

THE SIGNIFICANCE OF COWS' MILK WHEY FOR THE GENESIS OF ACUTE DIARRHEAL DISTURBANCES IN BABIES. EIGHTH COMMUNICATION — WHEY AND LACTOSURIA. ERNEST BERNHARD, Ztschr. f. Kinderh. **40**:275, 1926.

The fifth approach was to find some other evidence of injury by whey to the intestinal mucous membrane, than a delay in sugar absorption. It was found by examination of the urine that whey does make the intestinal mucous membrane more permeable to milk sugar.

THE SIGNIFICANCE OF COWS' MILK WHEY FOR THE GENESIS OF ACUTE DIARRHEAL DISTUBANCES IN BABIES. NINTH COMMUNICATION — AFTERWORD. H. FINKELSTEIN, Ztschr. f. Kinderh. **40**:277, 1926.

Finkelstein, in an afterword to the foregoing communication, points out that whole cows' milk whey has a great influence on the genesis of digestive upsets in babies which is diminished by dilution, but this is not the whole story because physical conditions must be taken into consideration, as other constituents of the milk are diluted at the same time. The abnormal blood sugar curves mean that there has been a disturbance of the sugar fixing function of the liver, and there may thus be an injury to this organ which leads to an abnormal breaking down of the protein and a subsequent toxic diarrhea. There is a conflict between clinical and experimental results, since the same acute diarrheal disturbances arise with either casein and whey without albumin, and casein with unchanged whey. One must be guarded in the conclusions which are drawn as to whether cows' milk whey plays a significant rôle or not. This is very difficult to determine clinically, but when a final decision is made, it is certain that whey will be found to be a factor.

INFLUENCE OF THE FEEDING OF COD LIVER OIL TO MILK COWS ON THE VITAMIN CONTENT OF THE MILK. RICHARD WAGNER and HANS WIMBERGER, Ztschr. f. Kinderh. **40**:295, 1926.

The milk of cows fed for seven months with large doses of cod liver oil had real healing effect on rachitic babies. The content of vitamin A, as well as of the antirachitic vitamin, had only an insignificant value as tested on rats.

EMERSON, Boston.

THE STOOLS OF NORMAL INFANTS, BREAST AND BOTTLE FED. DEBRE, GOIFFON and ROCHEFRETTE, Rev. franç. de Pédiat. **2**:18, 1926.

The authors review tests commonly used in the analysis of stools of adults, and apply these to the stools of normal breast and bottle fed infants. They show that the stools of the bottle fed infant approach those of the adult, while those of the breast fed infant give evidence of a more rapid passage through the intestine. The acidity of the stools of the breast fed infant is of a degree which would cause serious irritation in an adult, and the authors suggest that the mucosa of the intestine in the infant is comparable to that of the stomach in resisting acidity.

LESLIE, Chicago.

BACTERIOTHERAPY OF THE DIGESTIVE DISTURBANCES OF EARLY CHILDHOOD. A. POPOWA, Monatschr. f. Kinderh. **32**:193, 1926.

The author reviews the literature from the time of Escherich, showing that the endogenous flora of the infant's intestine is a factor of great influence in relation to gastro-intestinal disturbances. Certainly babies who have a predominance of the bifidus and lactic acid bacillus flora thrive better than those in whom *B. coli* predominates, especially when some strains of *B. coli* seem to have a specific diarrheal action. It occurred to Popowa that in some cases the beneficial effect of the lactic acid organisms might be due to ferments they contained. Yeasts seem to contain the same ferment. Accordingly he prepared mixtures of lactic acid bacilli and yeasts growing in symbiosis. After standardizing these mixtures he used them in treating children sick with nutritional disturbance. This treatment was tried in twenty-four cases. The results were surprising beyond description. Four curves are reproduced, and they are really worthy of study. The results of the treatment are striking.

THE SIGNIFICANCE OF CHANGED CARBOHYDRATE METABOLISM IN INTOXICATION OF INFANTS. S. I. FEDYNSKI, J. K. POLTIEWA and O. J. WILENSKAJA, Monatschr. f. Kinderh. **32**:205, 1926.

In a large number of cases the authors tried the combination of subcutaneous inoculations of glucose solutions plus insulin as a treatment for alimentary intoxication. They show a number of curves to prove this treatment successful in cases which gave a bad prognosis.

INSULIN AND KETONURIA IN CHILDREN. RICHARD FREISE and HILDEGARD BOERINGER, Monatschr. f. Kinderh. **32**:269, 1926.

In a number of diabetic children who had been treated with insulin, and in whom the urine was sugar-free, the authors noted an acetone odor to the breath. They attribute this to the large doses of insulin, and believe the acetone is due to a hunger acidosis to which children are notoriously susceptible.

NUTRITIONAL STUDIES ON ATROPHIC INFANTS. J. FRANKE and A. WITTENBERG, Monatschr. f. Kinderh. **32**:413, 1926.

Professor Moll, in his report of the last ten years of the national Austrian institute for infant welfare, tells that infant mortality was reduced markedly by a change in the technic of feeding in the last few years. Franke and Wittenberg tell how this was accomplished for atrophic infants. Their formulas contain a relatively low amount of milk and fat, with a considerable amount of protein and a large amount of carbohydrate. The latter was given in the form of dextrinized starch, corresponding to what we call flour-ball. The increase in the amount of welfare work throughout the community, however, reduced the number of severe nutritional cases in the last few years; so this institute did not have as many or as severely sick infants as in the years immediately after the war.

OBSERVATIONS ON ANOREXIA NERVOSA. OSCAR LOEWY, Monatschr. f. Kinderh. **32**:421, 1926.

The author divides nervous children into two types. One is restless, easily excited, timid, resists examination, cries easily, strikes at his mother but becomes relatively quiet and docile when reassured and taken away from a strange environment. The other type is the sullen, proud and introspective child who does not cry but who simply looks ahead with a scowl and will not become friendly. He is harder to approach than the former.

The treatment of these two types of children should, of course, vary. The nervous and excitable child should have his meals in a quiet room, either with an older brother or sister, or with a nurse whose influence is entirely restful and nonstimulating. Noise and excitement bewilder such a child and destroy his appetite. In contrast to this type, which the author calls "erythoid," is the other or "quiet" type. The latter is so introspective that any means which will arouse him from himself is justifiable. This is the child who is greatly helped by listening to stories when he eats. When his mind is diverted, his appetite returns. The author then describes a few cases to support his hypothesis.

A CASEIN-FREE DIET FOR CORRECTING DIARRHEAS OF INFANCY. LEOPOLD MOLL, Monatschr. f. Kinderh. **32**:428, 1926.

As there are still so many conflicting theories regarding the etiology of diarrheas of infancy, particularly in regard to the special element of the milk causing the disturbance, Moll obviated the difficulty by offering a milk-free diet, thus doing away with all possible elements causing the trouble. He mentions a pudding-tea diet which he has described in another publication. The pudding as he speaks of it seems similar to a thick cereal of the type used in pylorospasm. To this he adds whey prepared by adding from 4 to 5 Gm. calcium lactate to 1 liter of milk and heating the mixture. This whey contains only 0.3 per cent of protein in contrast to the 0.8 per cent protein obtained from whey prepared in the usual way.

This mixture is used from 3 to 7 days until the dyspeptic symptoms have disappeared. Loss of weight ceases in from 2 to 3 days. A return to a milk diet before the allotted time will result in a recurrence of the diarrhea.

In younger children, Moll uses the almond milk whey mixture also described by him four years ago in this journal. It consists of equal parts of emulsion of sweet almond (U. S. P.), and the calcium whey described to which 3 per cent rice flour has been added. This combination is similar to breast milk, except that it is somewhat poorer in fat and richer in minerals.

Moll then shows charts and gives case reports to show the effect of his treatment. The results of milk withdrawal are so apparent that the author believes we must revert in a way to the former idea of the evil of casein.

THE TREATMENT OF DIARRHEA IN THE BREAST-FED WITH "CALCIAMILCH." KARL NEUBAUER, Monatschr. f. Kinderh. **32**:441, 1926.

This is a case report of diarrheas of breast-fed children treated with "calcia-milk." The exact method of preparing this mixture is not given. It was apparently devised by Professor Moll of Vienna, and consists of milk treated with calcium lactate. The use of this mixture resulted in great improvement in the various types of diarrhea of breast-fed infants.

THE DIET OF CHILDREN DURING THE SECOND TO THE SIXTH YEARS. EUGEN STRANSKY, Monatschr. f. Kinderh. **32**:450, 1926.

A series of tables and charts is given, showing the food taken by the children in Stransky's institution. Analyses are made of the caloric value of the diet, as well as the content in protein, fat and carbohydrate. The usual requirements of the normal child is from 110 to 120 calories per kilogram of body weight. The protein requisite is 3 Gm. per kilogram. The relation of the elements of the food varies greatly, but the optimum seems to be protein, 15 per cent; fat, 35 per cent, and carbohydrate, 50 per cent. Children with normal appetites take diets rich in carbohydrate, while those with poor appetites prefer protein and fat. About two thirds of the group took two large meals, while the remainder distributed the food equally over the four meals. Stransky believes milk should be restricted to one-half liter daily.

DIARRHEA ASSOCIATED WITH SPIRILLAE IN INFANCY. ALFONS TRIAS, Monatschr. f. Kinderh. **32**:491, 1926.

Trias reports four cases of diarrhea in infants associated with the finding of spirillae in the stools. Whether or not these were the cause of the disease, the author is not certain. However, they were present in large numbers and disappeared again with the improvement of the intestinal condition. He reminds us that Escherich reported the same observation in diarrheal cases many years ago.

GERSTLEY, Chicago.

BIOLOGY OF SKIN AND HORMOCUTANEOUS TREATMENT OF RICKETS. M. LÉVAI, Wien. klin. Wchnschr. **39**:985 (Aug. 26) 1926.

In experiments on rabbits, Lévai found that intracutaneous injection of insulin gave greater and more prolonged depression of the sugar content of the blood than injection by the subcutaneous route. Intracutaneous injection of any substance excites general and local reactions; the character of the latter depends on the person as well as on the substance employed. Muller's hypothesis of a general reaction of the skin per se to irritation is questioned. The parasympathetic nerves may be involved in the reactions. The effect of insulin and of epinephrine was the same whether the intravenous, subcutaneous or intracutaneous route of injection was employed. This did not hold true for parathyroid and pituitary extract. When combinations of various hormones were injected intracutaneously, the effect on the sugar content of the blood was the resultant of the actions of the individual hormones.

Lévai does not subscribe absolutely to the theory of Langstein and Vollmer that rickets is of endocrine origin. It is more reasonable to believe that it is the result of acidosis due to chronic infection or autointoxication. There is no evidence for or against the hypothesis that the endocrine glands play a primary

or a secondary rôle. With regard to hormocutaneous therapy, it is possible that hormones may be altered during manufacture or application of ointments. Good results have been claimed in rickets by the use of nonspecific salves as well as by ointments containing hormone. This may be explained by stimulation of the skin or its parasympathetic nerves rather than by the absorption of hormones.

OLMSTED, Seattle.

Prenatal Conditions

HERMAPHRODITISMUS EXTERNUS FEMININUS. BELL W. BLAIR, Am. J. Obst. & Gynec. **10**:778, 1926.

The author reports four cases of intersexuality, three in children and one in an adult. The general characteristics of these cases were similar in that female internal genitalia were present but poorly developed. The external genitalia were feminine in type, except that there was a greatly hypertrophied phallus and partial obscuration of the vaginal opening. The secondary sexual characteristics were chiefly masculine and these developed very early.

These precocial secondary sexual characteristics are opposite in type to the declared sex of the gonads in these cases of partial hermaphroditism, and their differentiation is later than the primary determination of the gonads.

If a patient presents the aforementioned observations, and the gonads are absent in the inguinal region or external genital folds, the diagnosis of hermaphroditismus externus femininus is almost certain.

ALLEN, Chicago.

THE CARE OF THE PREMATURE INFANT. WILLIAM H. BRADLEY, M. J. & Rec. **124**:222 (Aug. 18) 1926.

The term, premature infant, refers to those infants whose gestation period was 260 days or less. A fetus of six months is not viable. The longer the intra-uterine life of the infant, the greater its chances of survival. Measures should be instituted to sustain the body temperature, and the infant should be disturbed as little as possible. If possible, the infant should be placed temporarily in some form of incubator. A description of how a nursery basket may be converted into an incubator is given in the paper. The nurse in these cases should be competent, interested and should realize her responsibility. It is necessary to push the feeding to the limit of digestive capacity. Tolerance for sugar appears to be greater than for fats and proteins. The nourishment should be given by a dropper or the Breck feeder, and if this method proves impracticable the baby may be fed by gavage through the nose or mouth. Few premature infants show a normal desire for food. While at first the baby may show a tendency to nurse, as it becomes weaker it sleeps incessantly and refuses to swallow. These infants should not receive their first feeding before a bowel evacuation has occurred. The presence of disease in the mother producing faulty nutrition in the fetus are detrimental to ultimate survival. The majority of premature infants without birth injuries show a normal mental development, except that they are slower in walking and in talking.

WILLIAMSON, New Orleans.

SEROTHERAPY AND CONGENITAL ALLERGY. PIERO BRUSA, Boll. d. Ist. sieroterap. Milan **5**:69, 1926.

Serum sickness of the accelerated type seen in persons sensitized by a previous injection of serum occurs in some children never before treated, and

may often be anticipated by finding that the mother has received injections of serum. The regular course of desensitization is then advised if the child requires serotherapy. This allergic state is not strictly hereditary, for it is derived only from the mother. It cannot be passed on to guinea-pigs and is regarded as a cellular hypersensitivity. If the mother's history is negative, a prudent decision as to the urgency of intravenous or intraspinal serum injection should be made.

ETHEL B. PERRY.

UNI-OVAL TWINS. F. BECKERSHOUS, Ztschr. f. Augenh. **59**:264, 1926.

Scientific determination that a given pair of twins is really uni-oval requires histologic examination of the fetal membranes, with the finding of a common chorion and placenta. This is sometimes difficult even at the time of birth, and the history of such an observation in after-life is of no value. Certain points of similarity found in uni-oval twins have been considered dependable evidence of this condition, and the author, with these points in view, has carefully examined twelve pairs of twins which he considered uni-oval. In four of these pairs, reliable examination of the fetal membranes confirmed this opinion. He found an exact similarity as regards color, form and distribution of hair and its tendency to become gray, color of skin, distribution of lanugo and structure of iris. The basic color of the iris depending on density and depth of the iris-stroma was also always identical, but slight differences in pigmentation of the anterior stroma were noted in two pairs of twins. In all but one pair, practically identical skull measurements were obtained, including the distance between the outer orbital angles. Pupillary diameter and reaction were always alike. The refraction was carefully estimated, and a more exact correspondence found in both corneal and total refraction than Jablonski and others had claimed. The greatest difference in total refraction found was one-half diopter. When one member had pigmented nevi, the other had also nevi, but not in corresponding locations, showing inheritance only of the tendency to nevus formation. The same was true of freckles. Finger imprints were taken, and while there was not complete correspondence, there was a great similarity, the prints of two corresponding fingers of the twins being more alike than those of the right and left hands of the same person. Such marked similarity is never seen in bi-oval twins, which are no more alike in this respect, as in other respects, than other brothers and sisters. From the constancy of these numerous points of exact similarity, there seems to be no doubt that the question of whether twins are bi-oval or uni-oval can be determined without examinations of the placenta. There is no general agreement as to the origin of uni-oval twins. Since on the basis of the possible variations between the characters determined by 24 chromosomes, an identical pair of children could occur only once in 200,000 trillion births, the author believes no other theory is tenable except that of the division of one egg fertilized by one spermatozoon. Fertilization of a binuclear ovum by two spermatozoa would never produce such close similarity as that observed.

GIFFORD, Omaha.

Diseases of the New-Born

POSSIBLE CAUSE FOR PEMPHIGUS NEONATORUM. R. E. KRIGBAUM, Am. J. Obst. & Gynec. **11**:494 (April) 1926.

Krigbaum associates the use of liquor cresolis compositus with the occurrence of pemphigus neonatorum. He thinks that there is a strong possibility

that the irritating alkaline solution is at times the cause of pemphigus. Therefore, no liquor cresolis compositus which has not been titrated to determine its free alkalinity should be used in delivery rooms or nurseries in such a way that it might come in contact with babies' skins; second, that one cannot eradicate an epidemic of pemphigus by changing the solutions in the delivery room or nursery without resorting to the usual methods of isolation and prevention, because, when an epidemic is once started, the mild staphylococcus increases in virulence as a result of its rapid transmission from one host to another, to such an extent that it becomes capable of infecting a normal non-irritated baby; third, as a precaution against the common form of impetigo, young children should be prohibited from visiting new-born babies during their confinement to the hospital.

[J. A. M. A.]

Sclerema Neonatorum. G. A. Harrison and J. W. McNee, Arch. Dis. Child. **1**:63 (April) 1926.

Five cases of this rare disease are reported. (In two of these the diagnosis might be questioned.) Postmortem examinations were made on four subjects; the fifth patient recovered. Excellent descriptions are given of the histologic findings, and are accompanied with photomicrographs, roentgenograms and color drawings. The subcutaneous lesions show firm fibrous trabeculae, abundant giant cells, a necrosis of fat cells, calcification, and an endarteritis obliterans. A chemical study was made of the crystals found in the subcutaneous fat.

Peterman, Milwaukee.

Streptococcus Pneumonia in a New-Born Infant, Probably the Result of Antenatal Infection. C. M. O'Connor, Bull. Buffalo Gen. Hosp. **4**:20, 1926.

A child, normal for the first twenty-four hours after birth, developed fever, cyanosis, rapid and shallow breathing, and died at the age of 30 hours. Necropsy showed pneumonia with pleurisy and some effusion. There were also some opaque patches in the leptomeninges, and some thickening of the serosa with a few fibrous bands in the abdomen. Sections of the lungs showed a high degree of marked interstitial inflammation in the pleura; most of the alveoli were filled with coagulated albuminous material only. Bacteriologic stains showed an abundance of gram-positive cocci in chains, chiefly in the pleura, in the interlobular septums and in the perivascular and peribronchial tissue; only occasional cocci were found in the alveoli. Cultures from spleen, lungs and liver showed hemolytic streptococci.

The mother, during the latter part of the pregnancy, had had a severe sinus infection. The distribution of the infection in the lungs points to a hematogenic rather than to a bronchogenic origin. The cord vessels were not inflamed. The lesions in the meninges and peritoneum indicated old inflammatory processes. The infection in the pleura may have remained dormant until the lungs were called on to function, thus accounting for the extra-uterine development of pneumonia from an infection incurred before birth.

Leslie, Chicago.

Phrenic Nerve Injury in the New-Born. Emanuel Friedman and R. S. Chamberlain, J. A. M. A. **86**:934 (March 27) 1926.

Shortly after birth, paralysis of the right arm was discovered in a baby girl. At about 13 days of age, respiratory irregularity was noticed and a short

time later cyanotic attacks appeared. At this date feeble breath sounds and moisture were heard in the right lung leading to a diagnosis of pneumonia. However, the right side of the diaphragm was high, with a paradoxical movement as shown by the fluoroscope. Both the paralysis of the arm and diaphragm disappeared after a time. The authors conclude that phrenic nerve paralysis is probably not a rare type of birth injury. Its presence should be excluded in every case of brachial palsy.

BONAR, Salt Lake City.

MASSIVE ATELECTASIS (MASSIVE COLLAPSE) OF THE LUNG. J. P. CROZER GRIFFITH, M. J. & Record **123**:103 (Jan. 20) 1926.

The author reported a case in a patient, aged 2 weeks, who was admitted into hospital on account of difficulty in swallowing. On admission, a trifling cough was noted. The previous history was negative, except that the infant was two weeks premature. The day after admission physical examination showed surprising results. Impaired resonance over the right lung, distant breath sounds and a few moist râles were found. The next day there was loud bronchial breathing and numerous fine râles over the whole right side. Roentgen-ray examination at this time showed a dense shadow throughout the entire right lung, and the shadow of the heart entirely on the right side. The child improved rapidly, and regurgitation ceased in a couple of days. Six days later all signs of consolidation had disappeared, and the roentgenogram showed that the heart had returned to normal position.

This case has practically nothing in common with the possible existence of ordinary atelectasis of the new-born, except the occurrence of prematurity. Probably in this instance the massive collapse was due to blocking of a bronchus by liquid food and viscid mucus. Absence of all ordinary symptoms of pneumonia tends to make this diagnosis the most justifiable.

The author refers the reader to the writings of Pasteur, Abt and Lee on this subject.

WILLIAMSON, New Orleans.

PATHOGENESIS OF DERMATITIS EXFOLIATIVA NEONATORUM. WILMA SZARKA, Monatschr. f. Kinderh. **32**:253, 1926.

Szarka reports the case of premature twins, in one of whom a typical pemphigus neonatorum and in the other dermatitis exfoliativa developed. In view of the conflicting opinions of the etiology of these diseases, the author believes her clinical observations support the view that the two diseases are of common origin.

GERSTLEY, Chicago.

Acute Infections

ACUTE SYNOVITIS OF THE HIP IN YOUNG CHILDREN. SAMUEL KLEINBERG, Arch. Pediat. **43**:215, 1926.

A comprehensive discussion of this affection, giving the differential diagnosis, is given by Kleinberg. The disease is found mostly between the ages of 2 and 8 years and is due to trauma. While the condition is really only of passing interest without grave consequences, nevertheless the symptoms may be severe enough to cause considerable anxiety. The symptoms are due to the synovitis and usually are noted several days after a fall or injury. Pain and limping appear first. Examination shows limitation of motion of the hip joint and a variable degree of muscle spasm. Fluid in the joint accounts for

swelling and the tendency to flex the joint. Roentgen-ray pictures fail to show any changes in the osseous structures.

Four case reports are given which bring out the result of treatment. This consists in immobilization of the hip and freedom from weight bearing. There is no tendency to chronicity, recurrence or complications.

EKIRI: AN EPIDEMIC INFANTILE DIARRHEA. KEIJI KAWATA, Arch. Pediat. **43**:257, 1926.

In some parts of Japan occurs an acute disease of infants, which simulates bacillary dysentery in its clinical picture and character of the stools. There is fever, prostration, slimy and blood stained stools, rapid and weak pulse and rapid respiration. Cramps occur which attack the finger ends, the face, limbs and the whole body, accompanied by loud cries. A colon-like bacillus has been isolated from the stools, and later a pseudodysentery bacillus was found as the cause of the disease.

Treatment consists in the subcutaneous injection of from 0.3 to 0.5 cc. of 1:1,000 solution of epinephrine every five hours until signs of recovery appear. Castor oil and infusions of saline are avoided, as these are thought to do harm. The epinephrine must be begun within six hours after the onset of fever. If one waits eight hours it is almost ineffective. By this new form of treatment the mortality has been reduced from 33 to less than 10 per cent.

INFLUENZA IN INFANTS AND CHILDREN. JAMES BURNET. Arch. Pediat. **43**:261, 1926.

In a recent epidemic, the author observed a large number of cases of influenza and he classifies them as follows: 1. The catarrhal type, which is the commonest. 2. The cerebral type, resembling meningitis and encephalitis. 3. The colic type, unaccompanied by vomiting or diarrhea, but with severe colicky pains about the region of the umbilicus and with tenderness in the same area. Cough was also present as in the catarrhal type. Treatment outlined consists of simple measures for the relief of symptoms, and a diet of milk, soups and puddings.

VON MEYSENBUG, New Orleans.

MEASLES PROPHYLAXIS. THE USE OF BLOOD FROM CONVALESCENTS IN A SCHOOL EPIDEMIC. JAMES H. TOWNSEND, Boston M. & S. J. **194**:869 (May 13) 1926.

The results shown in the following summary suggest the necessity of using larger amounts of blood.

1. The use of prophylactic measures in an epidemic of sixty-three cases of measles in a boarding school of 400 boys is described.

2. In a dosage of 20 cc., blood taken from an adult who had measles twenty years previously seemed to have no effect either in preventing or in modifying the disease.

3. Blood from convalescents in a dosage of 9 cc. of whole blood (5 to 5.5 cc. serum) had little or no effect in preventing infection, but influenced markedly the course of the disease when it was given before the end of the first week of the incubation period.

4. Thirty-two patients who received convalescent blood at least eight days before the development of the rash showed an average duration of the febrile period of 3.66 days, whereas twenty-one boys who received no inoculation showed an average duration of the febrile period of 6.45 days.

5. The average maximum temperature of the thirty-two who received convalescent blood at least eight days before the development of the rash was

102.5 F., whereas the average maximum temperature of the twenty-one who received no inoculation was 103.5 F.

6. The average stay in the infirmary of the thirty-two inoculated boys was 9.7 days, whereas the average stay of the control group was 13.0 days.

7. No complications whatever occurred in the inoculated group of thirty-two, whereas in the control group of twenty-one there was one case of bronchopneumonia, one of otitis media, one of frontal sinusitis and one of external otitis.

8. The mild character of the disease in many of the boys who received inoculations was very striking.

9. The inoculations had no ill effects whatever.

10. Beneficial effects were obtained whether the blood was administered as late as six days after exposure, or as early as twelve days before the probable date of infection.

GENGENBACH, Denver.

MEASLES TOXIN. N. S. FERRY and L. W. FISHER, J. A. M. A. **86**:932 (March 27) 1926.

A preliminary report is made on the preparation of measles toxin from a micro-organism isolated in pure culture from the blood of patients in the early stages of the disease. The organism grows luxuriantly in the presence of oxygen, and produces a soluble toxin specific to measles. The authors have named it *Streptococcus morbilli.* Proof of the etiologic relationship to measles of this organism is shown in experiments made on persons susceptible and those immune to measles as well as on persons suffering from measles. Horses and rabbits were injected subcutaneously with the specific toxin, and proof of the antitoxic properties of the serum from these animals was evidenced by its ability to neutralize the toxin both in vivo and in vitro.

TOXIN-ANTITOXIN. EDWARD L. BAUER and H. B. WILMER, J. A. M. A. **86**:942 (March 27) 1926.

One hundred and fifty thousand children, most of them fully immunized with toxin-antitoxin, have been under observation for a period of from one to five years, and none have given any marked reaction to toxin-antitoxin administration, or have shown any tendency to protein sensitization by test six months after injections. The authors are convinced that if the mixture is properly made and with the protein removed, no hypersensitivity to horse protein is developed. Further, they are convinced that it is safe and indeed wise to use toxin-antitoxin in asthmatic patients known to be susceptible to diphtheria.

IMMUNIZATION AGAINST DIPHTHERIA WITH TOXIN DETOXIFIED WITH SODIUM RICINOLEATE. W. P. LARSON and HOWARD EDER, J. A. M. A. **86**:998 (April 3) 1926.

Having found that experimental animals, such as rabbits and guinea-pigs, may be immunized with toxins detoxified by sodium ricinoleate, the authors tried them on human subjects. After having satisfied themselves that diphtheritic toxin soap was fully equal to, and in many respects superior to, toxin-antitoxin as an immunizing agent, the authors felt that they should investigate the possibility of immunizing in one treatment and, further, to determine the optimal interval between treatments for the best results, should repeated injections seem necessary. In one group, immunity developed in 38.5 per cent of

cases within five weeks following one injection. In another group 66.6 per cent became negative to the skin test in eight weeks. Repeating the number of injections does not seem to increase the number of negative skin tests within the first twelve weeks' period. Retests which are now under way indicate that the percentages of negative skin tests will be very much higher at the end of the six months period. The authors conclude that the sodium ricinoleate method is safe and effective in immunizing against diphtheria.

IMMUNIZATION AGAINST SCARLET FEVER WITH TOXIN DETOXIFIED WITH SODIUM RICINOLEATE. W. P. LARSON, E. J. HUENEKINS and WOODARD COLBY, J. A. M. A. **86**:1000 (April 3) 1926.

By using toxin that has been detoxified with sodium ricinoleate, the authors have modified the toxin without altering its antigenic properties, so that a large dose of toxin may be given without producing toxic effects. The detoxicating agent itself is not antigenic. Intramuscular injections of from 3,000 to 5,000 skin test doses are followed by little or no reaction. Children over 12 years of age and adults seem slightly more sensitive. The larger amounts of toxin, from 3,000 to 4,000 skin test doses, give an apparent immunity in from 77.3 to 90 per cent of the cases within eight days following immunization. As regards the duration of immunity, 70 per cent of those who gave a negative skin test within eight days following the small dosages were still negative at the end of six months. The authors are of the opinion that the antigen should contain not only scarlet fever toxin, but the streptococci as well, in order to develop an antibacterial as well as an antitoxic immunity.

OCCURRENCE OF THROAT INFECTIONS WITH STREPTOCOCCUS SCARLATINAE WITHOUT A RASH. FRANKLIN A. STEVENS and A. R. DOCHEZ, J. A. M. A. **86**:1110 (April 10) 1926.

An investigation as to whether an anginal infection with *Streptococcus scarlatinae* can occur without a rash resulted in the following conclusions:

1. Scarlatinal infection of the throat may occur without a rash.
2. This type of infection may occur in subjects showing negative skin reactions to scarlatinal toxin.
3. The Dick test is not a reliable index of immunity to such throat infections with *Streptococcus scarlatinae*.
4. In the series of cases observed, agglutination reactions with scarlatinal serum and toxin production are closely parallel.
5. There is no antigenic relationship between strains of hemolytic streptococci from acute streptococcus pharyngitis.

SIGNIFICANCE OF THE BLOOD CHEMICAL CHANGES IN PERTUSSIS. JOSEPH C. REGAN and ALEXANDER TOLSTOWKOV, J. A. M. A. **86**:1116 (April 10) 1926.

A total of 682 blood chemical analyses performed in cases of pertussis have given the following results: There is a diminution of the total inorganic phosphorus associated with a lowering of the hydrogen ion concentration of the blood, while the plasma bicarbonate remains within normal limits. These changes occur early in the disease; in the case of the inorganic phosphorus in the catarrhal stage. Both alterations are well developed, especially the change in phosphorus, during the first few weeks of the paroxysms, and show

a certain degree of parallelism in their course which signifies a close interrelation. In moderate and severe cases treated with alkalis, the inorganic phosphorus rises steadily from the third week, while in untreated cases of the mild type it does not begin until the sixth week. The diminution of inorganic phosphorus bears no relationship to age, but only to the stage of the disease. The calcium content has no constant alterations of a distinct type. These changes indicate an acidosis of an uncompensated type (type 6, Van Slyke), which has as a cause the accumulation or increased concentration of free carbon dioxide in the blood. The vomiting of the disease may be a compensatory mechanism adopted by the body to eliminate acid in an attempt to maintain normal acid base balance. This contention of an uncompensated acidosis is further substantiated by the effects on the disease of alkali therapy. Alkalis administered early appear usually to abort the disease, and associated with the cure is a rapid rise of inorganic phosphorus and a change in the p_H of the blood, while, if given late, cure supervenes in a relatively short period.

SCARLET FEVER: AN ANALYSIS. JANVIER W. LINDSAY, E. CLARENCE RICE and A. SELINGER, J. A. M. A. **86**:1194 (April 17) 1926.

From the studies of the authors the following conclusions are drawn:

The intracutaneous injection of properly concentrated scarlet fever toxin, after the method of the Dicks, properly controlled by use in groups, is a reliable means of determining susceptibility or immunity to scarlet fever. This method is also frequently of definite assistance in diagnosis. It is possible actively to immunize susceptibles for a considerable period. Care should be used to adjust the dose of toxin for active immunization so as to avoid serious reactions in those who may have an unusually small amount of natural toxin, as indicated by an unusually large and intensely positive Dick reaction. There is ample evidence that the serum prepared by the method of Dochez now available for the treatment of scarlet fever possesses true and specific antitoxic properties in effective concentrations. The early use of sufficient amounts of antitoxin apparently reduced the incidence of complications of severe degree. A single large dose of antitoxin will probably prove more satisfactory, from every standpoint, than a small or moderate dose with the possibility of repetition. The intramuscular injection appears to be satisfactory in practically all cases, the intravenous possibly being indicated in critical conditions. They suggest the advisability of testing all patients for sensitiveness to serum before giving the antitoxin, even though workers are not in complete agreement as to the importance of this procedure.

DOSAGE OF TOXIN FOR ACTIVE IMMUNIZATION AGAINST SCARLET FEVER. C. C. YOUNG and PAUL F. ORR, J. A. M. A. **86**:1340 (May 1) 1926.

It was found that, in a group of susceptible persons, just as great or greater immunity was obtained with three as with five injections of scarlet fever toxin. The dosage suggested by the observations is 500 to 5,000, and 30,000 skin test doses, respectively, with an interval of two weeks between injections. With the two week interval between injections, there is less systemic reaction and greater immunity is produced.

BONAR, Salt Lake City.

VALUE OF IODINE IN THE TREATMENT OF SCARLET FEVER. HARRY J. NOVACK, M. J. & Rec. **124**:267 (Sept. 1) 1926.

In his private practice, the author found that a colloidal preparation of iodine proved to be of more than usual value. When given at the earliest

possible moment of onset, the drug caused all symptoms to subside rapidly. When medication was begun several days after the onset, there was a mild reaction, all the symptoms becoming more intensified. Following this temporary reaction, the symptoms rapidly cleared up. When contacts were given a prophylactic dose, scarlet fever never developed.

A comparative study on 200 cases of scarlet fever at the Philadelphia Hospital for contagious diseases was made. The conclusions as regard to the action and therapeutic value of a colloidal preparation of iodine in such cases are given in the paper. Tables are also given, which show in detail the results of the test.

IMMUNIZATION AGAINST SCARLET FEVER. HARRY S. SNYDERMAN, M. J. & Rec. **124**:332 (Sept. 15) 1926.

The Dick test is a reliable index for determining the susceptibility or immunity to scarlet fever. The local effect of the scarlet fever toxin is more rapid than that of the Schick toxin. It begins to appear in from four to six hours, gaining its maximum in from eighteen to thirty-six hours, and it does not persist for more than forty-eight hours. The older the person, the greater the number of skin test doses required to produce immunity. Immunity is produced within two weeks after the last injection, but it is not permanent.

A person who gives a negative reaction and then a positive one requires much larger doses to become immune, and the immunity is of a shorter duration. Immunity lasts at least six months or longer, so during an epidemic we have the opportunity of using a valuable preventive agent. A single injection of a large dose will produce an early and lasting immunity.

WILLIAMSON, New Orleans.

HEMORRHAGIC SMALLPOX. J. A. WEBER and FRANK H. DOUGLASS, Northwest Med. **25**:379 (July) 1926.

Weber and Douglass report observations in ten cases of hemorrhagic smallpox, in which the patients varied in age between 8 and 65 years. Three were males and seven were females, all whites. In all cases there were shorter initial and eruptive stages than in the ordinary cases of smallpox. Nine of the ten cases were fatal. Four patients had never been vaccinated; three had had repeated unsuccessful vaccinations. The most recent vaccination in the patients had been nine years previously. These cases disprove the old dictum that a vaccinated person will never develop the hemorrhagic type of smallpox.

SCOTT, Philadelphia.

PARATYPHOID FEVER IN A ONE-YEAR OLD INFANT: CASE REPORT. EDWARD LEWIS, South. M. J. **19**:602, 1926.

A case of paratyphoid-B in an infant, aged 1 year, is reported. An elevation of temperature ranging from 104 to 100 F. continued for thirteen days, high at the outset, then gradually declining to normal and remaining so after the thirteenth day. On protein milk and buttermilk diet, the stools gradually improved and returned to normal at about the same time the temperature reached normal. There was evidence that the infection in the case was milk-borne.

SCHLUTZ, Minneapolis.

CEREBROSPINAL MENINGITIS. J. L. PAWAN, Ann. Trop. Med. **20**:195, 1926.

A man, aged 47, was admitted to the hospital, Nov. 17, 1925, with right purulent otitis media of two weeks' duration. With local treatment the discharge became less, but the headache persisted. Nine days after admission he developed definite symptoms of meningitis, and died the following day. Meningococci, determined by cultural and microscopic methods, were obtained from the purulent spinal fluid, and at necropsy from the exudate at the base of the brain. Pus from the mastoid, at necropsy, showed gram-negative, bean-shaped diplococci, but the culture was negative.

GIARDIA INTESTINALIS TREATED WITH STOVARSOL. J. L. PAWAN, Ann. Trop. Med. **20**:197, 1926.

A boy, aged 2½ years, became acutely ill with severe diarrhea, abdominal pain and elevation of temperature to 104 F. Active flagellate forms of *Giardia intestinalis* were found in the stools. Emetine, subcutaneously and by intestinal lavage, gave little relief. Five days after the onset, one grain of stovarsol was given by mouth with definite signs of improvement in twenty-four hours. The clinical symptoms disappeared after three additional daily doses of 1 grain, although giardia were still present in the stool. The treatment was continued at two to three day intervals for another twenty days, with disappearance of the parasites from the stools.

PYELITIS ASSOCIATED WITH ENTAMOEBA HISTOLYTICA. J. L. PAWAN, Ann. Trop. Med. **20**:199, 1926.

A woman, aged 58, who had suffered from periodic attacks of amebic dysentery, developed signs of acute cystitis. *Entameba histolytica* were found in the urine. The condition was cured by the use of emetine. The author mentions reports of other cases of amebic pyelitis.

GERSTENBERGER, Cleveland.

VARICELLA ENCEPHALITIS AND VACCINIA ENCEPHALITIS. D. W. WINNICOTT and N. GIBBS, Brit. J. Child. Dis. **23**:107 (April-June) 1926.

A case of varicella encephalitis is reported, and the other cases which have been described in the last thirty years are collected and quoted. Similarly a case of vaccinia encephalitis is described, and forty-four other cases of possible vaccinia encephalitis are quoted from the literature.

Both cases appeared clinically like rather severe cases of typical epidemic encephalitis lethargica, and in both cases there was complete recovery.

Two cases of measles encephalitis are described in brief.

LANGMANN, New York.

SEVERE TYPE OF SCARLATINAL NEPHRITIS. ALEXANDER JOE and A. B. WILLIAMSON, Edinburgh M. J. **33**:49, 1926.

It is well known that the severity and complications of scarlet fever fluctuate with the types of the disease. The authors note the run of severe cases in the Edinburgh Hospital during the past six years. They have studied the figures in two-year periods since 1918. The complication of severe nephritis (not simply albuminuria) shows a definitely increased percentage, and the mortality likewise higher in the recent years. In Edinburgh, the instance of this com-

plication has risen from 1.4 per cent in 1919 to 4.9 per cent in 1924. Among the deaths from scarlet fever, nephritis has been found to be causative in an increasing percentage until it is now 12 per cent. This can only mean that in Edinburgh during recent years there has been a marked nephrotoxic tendency in scarlet fever.

Clinical features of the nephritic complication are the appearance of nephritis on the eighteenth day as a rule, and at an average age of 4 years. The onset is insidious, usually with no symptoms except albuminuria discovered by routine examination. In other cases, the early common symptoms are puffiness of the eyelids, headache and flushing of the face. Later in the course, general edema appears and a low irregular temperature, to become high at the last. The pulse shows high tension, rapidity and irregularity. Venesection and lumbar puncture during convulsions have been found to be without benefit. Marked oliguria developed in all of the nineteen cases. Only a trace or moderate amount of albumin was present and seldom gross blood. Microscopically, blood cells and epithelial casts were always found, and in many instances hyaline, granular and bloodstained casts. The severity of the case was not revealed by the urine examination. Death occurred in from one to ten days after appearance of nephritis, an average of six days. Unfortunately, only one necropsy was permitted. Here the kidneys showed acute tubular degeneration.

NEFF, Kansas City, Mo.

ON THE "AVIDITY" OF DIPHTHERIA ANTITOXIN. T. MADSEN and S. SCHMIDT, Ann. de l'Inst. Pasteur **40**:300, 1926.

By "avidity" of diphtheria antitoxin is meant the speed of its combining reaction with toxin. This is demonstrable in vivo as well as by the flocculation method of Ramon. Serums vary greatly in avidity while having a correspondingly smaller range in antitoxin units. A serum with great avidity has much higher curative value than one of low avidity. Avidity remains almost constant in a given animal during immunization.

G. B. RHODES.

THE DICK TEST IN MEASLES. JEAN PARAF, Bull. et mém. Soc. méd. d. hôp. de Paris **50**:506, 1926.

Uncomplicated measles had no effect on the Dick test. The reaction was the same in all cases during and after the attack. Twenty-three children with complications following measles had positive reactions at the beginning of the illness and negative reactions afterward. In seventeen of these children streptococci were found. Three of them had positive tests before they developed the measles. The author concludes that measles complicated by streptococcus infections can cause a positive Dick reaction to become negative, and that doubt of the specificity of the Dick test for scarlet fever is justified.

B. R. LOVETT.

IMMUNITY TO MEASLES. L. RICCIARDI, Pediatria **33**:1333, 1926.

Ricciardi states that the use of convalescent measles serum has a decided prophylactic value, but because of the difficulty of obtaining a large amount of it, its use cannot become practical. According to the author, rational and safe immunization can be obtained by the use of the Caronia vaccine. Caronia has described an organism, a diplococcus, as the cause of measles and has made

a vaccine from this organism. During an outbreak of measles in the Children's Hospital in Naples, sixty-six infants and children who were exposed were given the vaccine. A course of four injections were given, on alternate days; 2 cc. of the vaccine was given intramuscularly each time. Five infants developed a mild general reaction and seven a mild local reaction. It is interesting to note that of all the children in the institution, only four developed measles and that in these the disease was very mild, the temperature not higher than 38 C. (100.4 F.) and the rash was also mild. The other sixty-two children who received the vaccine did not develop measles. Ricciardi's results coincide with those of Caronia, who has already reported on the use of his vaccine, both as an immunizing and curative agent in measles.

DE SANCTIS, New York.

IMMUNIZATION AGAINST DIPHTHERIA WITH ANATOXIN. P. S. SRODOWSKI and H. BRENN, Centralbl. f. Bakteriol. O., I. **97**:125, 1926.

The authors confirm Ramon's work. The change of toxin to anatoxin is gradual, depending on the concentration of formol and the time. Not every toxin is readily converted to anatoxin. A complete and constant change occurs in thirty days with 0.5 per cent formol (40 per cent) and a temperature of from 40 to 42 C. Guinea-pigs resist 2,000 to 6,000 minimal lethal dose. The flocculation capacity remains. Addition of 0.5 per cent phenol destroys the flocculation capacity of the product. A good flocculating anatoxin has a high antigenic power. Immunity is established in from fourteen to forty-five days, rarely in from fifty to fifty-two days. Phenol lessens this power. A mixture of anatoxin and antitoxin results in reduction of antigenic value. They vaccinated 200 children and adults. Young children resist vaccination better and withstand larger doses. They give to young children from 0.3 to 0.5 cc. and even from 0.5 to 1 cc. and to school children from 0.2 to 0.3 cc. They believe that the French workers inject too much (from 0.5 to 1 cc.). As small a dose as 0.1 cc. may produce a negative Schick reaction. Guinea-pigs that received the anatoxin but in which immunity was not as yet established became extremely sensitive to the toxin. The same occurs in man during this period. It is probably an allergic manifestation. Anatoxin is a more effective immunizing agent than the hyponeutral toxin-antitoxin mixture.

E. E. ECKER.

THE NATURE OF THE BLANCHING-PHENOMENON. S. I. ZLATOGOROFF and W. S. DERKATSCH, Klin. Wchnschr. **5**:445, 1926.

The capacity of a serum to blanch scarlatina exanthem is related to its content of specific antistreptotoxins (Schulz-Charlton substances). Active serums may be prepared by immunization against streptotoxin, against living, virulent cultures of toxic streptococci, or against virulent scarlatina material containing hemolytic streptococci. They cannot be prepared by immunization against inactive toxin or against dead streptococci which have been washed free from toxin. Serums active in producing the blanching phenomenon are also agglutinative for the scarlatina streptococcus and give complement-fixation reactions with antigens prepared from the desquamated skin of scarlatina patients.

ARTHUR LOCKE.

THE DICK REACTION AND SCARLET FEVER VACCINATIONS WITH STREPTOCOCCUS VACCINE. B. VAS, Klin. Wchnschr. **5**:1232, 1926.

One thousand seven hundred and two persons of various ages in several institutions were tested with material prepared according to Drs. Dick. Of these, 759, or 44.6 per cent, were positive; 943, or 55.4 per cent, were negative. Different institutions showed variations in the percentage of positive reaction, which variations are difficult to explain. Among persons who gave a history of having had scarlet fever, 20 per cent gave positive Dick tests. Vas doubts the reliability of such anamneses. Classified according to ages, Vas's tests gave the following group percentages: from 2 to 5 years, 74 per cent positive; from 5 to 10 years, 48 per cent positive; from 11 to 15 years, 45 per cent positive, and from 16 to 20 years, 39 per cent positive. The degree of susceptibility in his series of older persons is higher than in the statistics of Zingher or of Bokay-Johan.

For vaccinations against scarlet fever, Vas used material prepared from specific streptococci, but not according to the Dick method. With three injections of his vaccine, in a series of 585 previous positive Dicks' reactions, he obtained negative tests in 56.9 per cent, modified tests in 14.7 per cent and persistent positive tests in 28.4 per cent.

EXPERIENCES WITH THE NEW MEASLES SERUM OF DEGKWITZ. B. DE RUDDER, Klin. Wchnschr. **5**:1406, 1926.

The difficulty of obtaining convalescent measles serum led Degkwitz to utilize serum from goats which had been injected with cultures of measles virus. In administering goat serum, Degkwitz advised later injection than when using convalescent serum. The measles goat serum should be injected between the seventh and tenth day of incubation. Measles convalescent serum is effective used no later than the sixth day of incubation. De Rudder's experience with the measles goat serum leads him to doubt the effectiveness of the goat serum, particularly that available in the market; he thinks its general use for prophylaxis somewhat premature.

SCHWARTZ, Milwaukee.

ON THE HISTOPATHOLOGY OF EXPERIMENTAL ACUTE POLIOMYELITIS (HEINE-MEDIN) IN MONKEYS AND GUINEA-PIGS. HANS GERHARDT CREUTZFELDT, Ztschr. f. Hyg. u. Infectionskrankh. **105**:402, 1925.

From a detailed study of the histology of the spinal cords of two monkeys (*Macacus rhesus*) and one guinea-pig, it is concluded that poliomyelitis was present in the guinea-pig whose source of infection might have been one of the monkeys previously injected with Heine-Medin virus; that the edema is of great importance in the course of the disease; that the leukomyelitis, setting in simultaneously with the nerve cell affection, lasts longer and is comparatively sparing of the long sensory tracts (dorsal fibers); and that the neuronophagy in primates, according to histopathologic evidence, is accomplished not by leukocytes, but by glia cells (Hortega cells).

ETHEL B. PERRY.

PROPHYLAXIS AGAINST MEASLES, BY CARONIA'S VACCINE. E. NOBEL and M. SCHÖNBERGER, Ztschr. f. Kinderh. **40**:197, 1925.

Nobel and Schönberger used Caronia's vaccine on twenty-five children, among whom there were eighty-eight probable exposures to ten cases of measles.

Only two children acquired measles. They conclude that not all cases are protected by the serum, particularly when there are mixed infections. If the vaccine is given as late as the fifth or six day of exposure, there is great probability of protection but not certainty. The probability is much increased if the vaccine is given on the first day. The specificity of the cutaneous reaction to the filtrate of the measles culture has not been proved.

SECOND ATTACKS OF MEASLES. BERNHARD DE RUDDER, Ztschr. f. Kinderh. **40**:289, 1925.

De Rudder reports one subject in whom measles occurred twice in the same institution, under careful observation.

EMERSON, Boston.

THE FEVER AND BACILLUS TYPE OF DYSENTERY AND EKIRI IN CHILDREN IN MANCHURIA. NAOTOSHI HOSHI, J. Orient. Med. **4**:64-65, 1926.

During the last four years, 525 cases of dysentery, ekiri and enteritis were under care in the children's clinic of the Dairen Hospital. Of these, 266 cases were of bacillary dysentery and the following conclusions were made:

I. Five fever types of dysentery and ekiri were discovered. A certain number of patients who died, and a certain number of patients who had been suffering from dysentery before admission to the hospital, but whose special fever type could not be ascertained until after admission, were excepted from this class.

Particulars of the five types are:

(1) First type. (A-type). The temperature in these patients rose suddenly, then gradually fell in about three days, the patient subsequently being restored to health. The percentage of cases of this type was 27.7.

(2) Second type. (B-type). The fever rose suddenly, falling in two or three days, but was repeated in five or six days more, when it then fell to normal. This percentage of cases was 32.3.

(3) Third type. (C-type). The temperature did not immediately decrease, continuing, but level. The proportion of this group was 30.3 per cent.

(4) Fourth type. (D-type). The temperature of this group was irregular. The percentage was 6.5.

(5) Fifth type. (E-type). No fever was present in this type. There were 3.2 per cent of these cases.

II. Cases infected with the bacillus of Shiga were quite numerous and might be classed with the C-type of temperature. They amounted to 82 per cent. The cases that might come under the B-type of temperature amounted to 18 per cent. There were none of the A-type.

III. Cases infected with no. II and no. III of the dysentery bacillus (Shiga agglutination classification) belonging to the A-type amounted to 36 per cent, to B-type 34 per cent, and to C-type 30 per cent.

IV. Cases infected with no. IV and no. V of the dysentery bacillus (classified by agglutination) yielded: B-type 46 per cent, A-type 33 per cent, and C-type 21 per cent.

V. Cases infected with the Y-bacillus (classified by the fermentation of sugar) belonging to the B-type amounted to 52 per cent, the A-type 38 per cent and the C-type 8.7 per cent.

VI. The cases infected with the Flexner bacillus amounted to 38 per cent in the B-type, 33.3 per cent in the C-type, and 27.4 in the A-type.

VII. Clinically, the cases belonging to the A-type of fever were not of a serious nature, amounting to 58 per cent. B-type cases might be taken as

moderate and amounted to 62 per cent. The C-type, which amounted to 67 per cent, were regarded as the most serious of all.

VIII. The first acme of temperature in the B-type is thought to be a symptom of intoxication, and the second acme is considered to be due to some cause in the intestines.

IX. The cases which are considered the most severe and serious belong either to the A-type or D-type of fever, and are usually regarded as fatal.

BARNETT, Chicago.

A FEW PRACTICAL HINTS FOR THE CLINICAL DIAGNOSIS AND TREATMENT OF CHOLERA. C. VOONPING YUI, Nat. M. J. China **11**:426, 1925.

Early diagnosis based on clinical observation is necessary for successful treatment of cholera, since it is usually acute in onset and rapid in course, and it might prove fatal to wait for the laboratory report. Diarrhea with rice-water stools, vomiting and pain in the abdomen are symptoms of the first stage. Ptomaine poisoning and acute bacillary dysentery may be mistaken for cholera, but dehydration is not so rapid or sudden in these diseases. Treatment should be based on a knowledge of degrees of dehydration. The author gives forms of treatment before and during dehydration or collapse. He recommends transfusions, citing indications for and discontinuance of them. He also outlines a diet for patients. Since germs may be harbored from one to six weeks, the patient should be kept in hospital during convalescence as long as he is passing cholera vibrio.

CHOLERA CASES TREATED IN THE MUNICIPAL ISOLATION HOSPITAL FOR CHINESE, SHANGHAI, 1925. R. N. MCKINSKY and F. D. ZAU, Nat. M. J. China **11**:434, 1925.

An outbreak of cholera occurred, after the absence of this disease for several years. The authors found only forty-nine genuine cases, five of these in children, in two of which the condition ended fatally. The death rate in this group was 12 per cent. Coma in the reaction is as dangerous a symptom as uremia. The prognosis is poor in children. The authors gave no medication by mouth while the disease was active, except sips of potassium permanganate solution or soda bicarbonate solution if vomiting was present. Congee water was given after signs of relief appeared. When stools became fecal in character, a light diet, thin congee, eggs, etc., were recommended and a full diet only after the stools were well formed. No patient was allowed to leave hospital until the stool culture was negative.

INFLUENZA WITH SPECIAL REFERENCE TO SYMPTOMS, DIAGNOSIS AND TREATMENT. H. LOVETT CUMMING, Nat. M. J. China **12**:31, 1926.

This is a long article, and only a few points will be noted. The history, bacteriology, distribution of the influenza bacilli in the tissues, symptoms of the various types of influenza, diagnosis and treatment are discussed. Treatment is noted for all the various symptoms and preventive measures, vaccines, etc., are cited. The author considers rest in bed and avoidance of chills are most important even in a mild attack of influenza, and to prevent a recurrence of bronchopneumonia should it have been a complication. Examination of the throat is always important, especially during epidemics (uncomplicated, complicated with bronchopneumonia, with pleuropneumonia and gastro-enteritis, with recurrent patches of bronchopneumonia and septic influenza), as well as

four charts of sporadic dengue, because of the likelihood of confusing the diagnoses.

REMARKS ON THE SCARLET FEVER STREPTOCOCCUS ANTITOXIN. J. W. H. CHUN and H. JETTMAR, Nat. M. J. China **12**:125, 1926.

These authors review the experimental work on *Streptococcus hemolyticus* in scarlet fever leading to the recent discoveries of Dochez, the Dicks, etc. They state that scarlet fever, being of recent origin in China, assumes a very virulent form with a very high mortality. They experimented with both the Dicks and Dochez antitoxin on unselected cases, and on the whole their results were not encouraging. They suggest that American antitoxin may not be so effective on Chinese patients, and that local strains of *Streptococcus hemolyticus* may prove more successful. At present they are immunizing horses with Harbin strains of *Streptococcus hemolyticus* from fatal cases of scarlet fever according to the methods of the Dicks and Dochez, and hope to show better results with this antitoxin.

MERCUROCHROME-220 SOLUBLE IN THE TREATMENT OF TYPHOID AND PARATYPHOID FEVERS. E. S. TYAU, Nat. M. J. China **12**:152, 1926.

This is a report of seventy-two cases of typhoid infections which were treated with intravenous injections of a 1 per cent solution of mercurochrome-220 soluble in distilled water. The drug was freshly prepared and given at three day intervals in 10 cc. doses for mild infections, and for severe cases in dosage of 5 mg. per kilogram of body weight. The author concludes that if this is given early and carefully it is a most efficient remedy, and in mild and uncomplicated cases it is not only 100 per cent efficient for cure but shortens the course of the disease. There were six deaths in the group, only three of which might have been due to the mercurochrome, and the author feels that these might have been prevented had they known the precautionary measures. Typical case histories and charts of the different groups, uncomplicated, complicated and fatal are given, as well as a short list of references.

LUCAS, San Francisco.

Chronic Infections

HEALED MILIARY TUBERCULOSIS OF THE LUNG. WILLIAM S. MIDDLETON, Am. J. Roentgenol. **14**:218 (Sept.) 1925.

The author presents a patient as having a case of healed miliary pulmonary tuberculosis, in spite of a syphilitic history and a 4 plus Wassermann test of the spinal fluid. The normal appearance of the lung between the calcareous deposits is suggestive of tuberculosis, as gumma usually has sharp bands of fibrous tissue radiating into the surrounding lung tissue.

STULIK, Chicago.

THE TREATMENT OF SYPHILIS OF THE CENTRAL NERVOUS SYSTEM. FREDERIC J. FARNELL, Am. J. Syph. **10**:236 (April) 1926.

Farnell emphasizes the fact that one should not only treat the syphilis, but should treat the patient and his syphilis. He finds that intraspinal treatment is of value in selected cases. He advises it in the following conditions:

1. In early tabetic subjects who are not responding well to intravenous treatment. 2. In certain types of cord syphilis. 3. In fairly advanced combined

sclerosis. 4. In early multiple sclerosis. 5. In the exudative form of meningoencephalitis with a tabetic symptom complex.

The technic employed causes very little discomfort to the patient. The serum treated with arsphenamine is prepared as for the Swift-Ellis treatment. The patient reports at the office during the business hours. He is prepared as for a lumbar puncture, and from 20 to 50 cc. of the serum is given extradurally in the first or second lumbar space. From three to seven minutes are required for the injection. At the conclusion of the injection the extradural pressure is practically nil. The patient may return to his work at once without discomfort.

In cases with intervertebral neuritis the injection of 20 to 50 cc. of physiologic sodium chloride solution in the same manner is very beneficial. This may correct tabetic pains which have failed to respond to arsphenamine given intravenously.

In those patients who fail to respond to arsphenamine intravenously and iodides by mouth, the author has found hypertonic iodide solutions intravenously to be very beneficial. A noticeable improvement in physical and mental symptoms is produced when a dose of tryparsamide is followed in forty-eight to seventy-two hours by a hypertonic solution of iodide intravenously.

McBride, Iowa City.

Treatment of Neurosyphilis by Malaria. Paul O'Leary, W. H. Goeckerman and S. T. Parker, Arch. Dermat. & Syph. **13**:301 (March) 1926.

The literature is reviewed and clinical experience over a period of ten months is recorded. The authors believe that the method offers greater immediate benefit in general paralysis than any method previously tried. Of those with frank paresis 25 per cent showed complete remission and 37 per cent showed definite improvement. Practically no effect was observed in cases of optic atrophy, gastric crises, persistent lightning pains with negative serologic findings, asymptomatic neurosyphilis and paresis sine paresi. The changes observed in paresis were in the mental and physical symptoms. No change was noted in the objective or serologic observations. The use of antisyphilitic remedies immediately following the malaria was attended with relapse from remission. They believe their results warrant an exhaustive trial of the method.

Jeans, Iowa City.

Bronchial Gland Tuberculosis. John B. Hawes, Arch. Physical Therapy **7**:11 (Jan.) 1926.

This is the preliminary report of six months' observation on about 100 children aged between 7 and 14 years. The children are not active cases of tuberculosis, but are rather contact cases, having a positive Pirquet reaction, roentgen-ray evidence of bronchial gland or hilum tuberculosis, and, further, have not gained in their previous surroundings. The authors have studied the physical signs and laboratory findings in these cases, and they agree that the diagnosis of tuberculosis in this age offers difficulties. The interpretation of physical and roentgen-ray observations are not uniformly satisfactory. They conclude that both d'Espine's and the Eustace Smith sign are of comparatively little value. Having checked over the roentgenograms themselves and had the same films interpreted by other roentgenologists, they conclude that the interpretation of roentgen-ray shadows of the hilum region in children is not

constant; first, as to normal or abnormal, and second, tuberculous or non-tuberculous. They finally conclude that the diagnosis of such cases must be based on history, exposure, the Pirquet test, constitutional signs and symptoms.

CHAMBERLAIN, Chicago.

INTERSTITIAL KERATITIS. MAUD CARVILL and G. S. DERBY, Boston. M. & S. J. **193**:403, 1925.

This is a discussion of approximately 1,000 cases of interstitial keratitis treated at the Massachusetts Eye and Ear Infirmary. The incidence of the disease among eye cases at this hospital is 0.45 per cent, and tables are shown of the age of onset, incidence of sex, visual results in both treated and untreated cases, course of the disease, duration of attacks, recurrences, other members of the family, treatment, etc.

CONGENITAL SYPHILIS AS A CAUSE OF MENTAL DEFICIENCY. N. A. DAYTON, Boston M. & S. J. **193**:668, 1925.

A review of 9,183 cases of mental defect, compared with 16,156 cases of nondefective children showed only a difference of 1.1 per cent in the Wassermann reaction. Defective cases showed the highest percentage of positive Wassermann reactions, but the author states that from these statistics it would appear that congenital syphilis is not of great importance as a cause of mental deficiency.

LANE, Boston.

HETEROPHIL ANTIGEN-ANTIMONY REACTIONS. IN RELATION TO THE SERUM DIAGNOSIS OF SYPHILIS BY PRECIPITATION. SANFORD BURTON HOOKER, J. Immunol. **11**:403, 1926.

The observations by Taniguchi, Schmidt and others that alcoholic extract of guinea-pig heart sometimes may cause a false positive test when used as antigen in the Wassermann reaction is confirmed in this report. This false positive reaction can be due to the presence in certain human serums of lysin for sheep corpuscles; this lysin is a so-called heterophil antibody because it unites not only with sheep corpuscles but also with substances (heterophil antigens) in the organ cells of guinea-pigs and certain other animals. Obviously, human serum containing this lysin may react in fixation or precipitation with extracts of guinea-pig or other heterophil tissue. Fortunately, beef heart is not heterophil in this sense. Laboratories that use extracts of guinea-pig or horse heart as antigens in the Wassermann test should not fail to take into account that positive reactions may be produced through a nonsyphilitic mechanism.

[ARCH. PATH.]

THE VIRULENCE OF TUBERCULOUS VIRUSES. W. T. MUNRO and W. M. CUMMING, Edinburgh M. J. **33**:97 (March) 1926.

This is the first article of the series in this number of the Journal devoted to tuberculosis. The writers cultured "viruses" from various sources. From human sputum, only two of 100 strains were found to be bovine. From the glands and milk of cattle and swine all strains were bovine. From human surgical lesions (including glands, bones, joints, urine, cerebrospinal fluid, skin and subcutanous tissues, pleural fluids, etc.), forty-two were human and twenty were bovine. The virulence was assessed by injection into rabbits. The bovine

virus killed the animals about the thirtieth day; the human virus did not kill the animals. The progressiveness and the generalization of the lesions were regarded as the index of the virulence. Human viruses produced either no disease, or moderate lesions localized to the lungs and kidneys. Bovine viruses caused generalized progressive disease.

The writers believe it possible, though not proved, that a bovine infection in the human being may adapt itself to a human environment, and when affecting the viscera conforms to the human type. Figures are quoted which show that in children pulmonary tuberculosis is practically always due to the human type, while glandular, abdominal, bone and joint, and generalized tuberculosis may be due to either one, the incidence varying with the nature of the tissue or with the age of the child. In Edinburgh, the glandular disease is nearly always bovine.

USE OF LIGHT IN THE TREATMENT OF TUBERCULOSIS. SIR NORMAN WALKER, Edinburgh M. J. **33**:122 (March) 1926.

Tuberculosis of the skin only is considered in this paper, and by an observer who has seen 1,000 or more cases and has tried various types of light. He now uses the open arc lamp which he regards curative if treatment is continued as long as necessary. Among the 108 recent cases, thirty-three were in children.

SCROFULA AND TUBERCLE, WITH REFERENCE TO ANCIENT AND MODERN DOCTRINES OF ABNORMAL CONSTITUTION IN TUBERCULOSIS. CHARLES MCNEIL, Edinburgh M. J. **33**:137 (Aug.) 1926.

Scrofula is now an obsolete word, used only in such terms as the "scrofulous child, conjunctivitis, keratitis or scrofuloderma," and a survival of the ancient conception that constitution explains the presence or cause of disease. It has always been closely associated with tuberculous glands or lungs. The author traces through history the doctrine of the relation of scrofula and tuberculosis to constitution, and discusses the question as to whether it has any reason for existence in modern medical thought. Scrofula (the King's Evil) for 800 years was treated by the touch of the kings of England and France. Not till Browne's writings in 1864 did superstition give way to a return to that spirit of inquiry earlier taught by Hippocrates and Galen. Cullen of Edinburgh in 1778, and Laennic about 1820, marked a great advance in the recognition of the cause of scrofula, phthisis and tubercle. Fifty years later two new words, scrofulosis and tuberculosis, came into use. However, there still remained the idea that some constitutional factor was the underlying basis.

Finally, with Virchow, the terms constitution and diathesis appeared to mark the change in the conception of disease from a humoral to cellular theory. Inoculation experiments and the discovery of the bacillus in human tuberculous tissue proved the identical cause of scrofulous glands and the phthisical lung. The theory of the existence of a tuberculous constitution has with difficulty been excluded from modern belief, although the transmission of bovine tubercle by milk, the universal presence of the bacillus, and the rarity of congenital tuberculosis in infants have shown that there is no need for a hypothetic constitution derived from tuberculous parents.

The scrofulous constitution is still regarded by some as existent. McNeil discusses the scrofulous child, the strumous conjunctivitis and keratitis, the exudative diathesis, and other scrofulous lesions, from the standpoint of their historic significance and the justification for the use of the term "scrofulous

constitution." Instead of the traditional idea of abnormal constitution in children in which there was supposed to exist a quality which produced the disease, instead of the later conception of a diathesis, disposition, or tendency to the disease, McNeil proposes a third meaning for abnormal constitution, namely, an "abnormal general state of body which alters the character or type not merely of tuberculosis but of any and all diseases," this being a change in the general body chemistry affecting the body functions both in health and in disease.

McNeil considers the evidence in favor of abnormal constitution in children. He thinks that the peculiarities of childhood such as normally rapid pulse, increased breathing and rapid growth, and the peculiarities of disease at this time of life with the freedom from many of those which attack adults, are evidences of a different constitution which children possess. The rate of living is high in early life, but vital activity may become more rapid in one child or retarded in another. Some children show an acceleration of inflammatory reactions to disease, and in these McNeil believes there is clinical and anatomic evidence of abnormal constitution. He has seen fulminating cases of pneumonia possibly due to associated lymphoid and thyroid hyperplasia. Accelerated or fulminant types of tuberculosis, though rare, might likewise occur in children with abnormal constitution. Jenner and Watson made a distinction between the sanguine and the lymphatic child, and such types of children suggest an analogy with exophthalmic goiter and myxedema. Jenner associated a phlegmatic temperament with the peculiar pathologic tendencies of scrofula; a highly developed nervous system, active mind and body, clear complexion, etc., with the pathologic tendencies of tuberculosis. McNeil believes that such clinical types are seen, but one may not be justified in interpreting them as did Jenner and Watson. These different types are those of abnormal constitution, which is not common in childhood, but when present may coexist with diseases, though the diseases are not dependent on it.

The writer concludes that scrofula is a suitable term for glandular tuberculosis, but that it should not give the idea of abnormal constitution. Tuberculous parents do not bestow any predisposition or tendency to tuberculous disease. The "scrofulous diathesis" may be present or absent in tuberculosis, or may occur in some nontuberculous children. The tuberculin reaction in the skin may be severe in local tuberculous diseases, and there may be a coexistence of status lymphaticus, a condition which is sometimes found with fulminant types of other infectious diseases. Thyrolymphoid hyperplasia is present in many of the cases of status lymphaticus, due to an abnormal condition of metabolism, or, in other words, an abnormal constitution.

NEFF, Kansas City, Mo.

TUBERCULOSIS IN CHILDHOOD. PIRQUET, Rev. internat. de l'enf. **1**:15 (Jan.) 1926.

Pirquet, in a brief article, calls attention again to the fact that although consumption has been recognized as a disease of the first magnitude for centuries, it is only about forty years since clinicians accorded it a place in the nosology of childhood. He emphasizes the particular danger of contact in infancy, and the likelihood of recrudescence in arrested cases at the time of puberty. The menace in latent infections of excessive fatigue, privation and undernourishment, is stressed. Pirquet recommends that hygienic management be combined with specific treatment, and closes his paper with a résumé of the antituberculosis work now under way in the United States.

HELIOTHERAPY IN SURGICAL TUBERCULOSIS AND THE NEED OF PUBLIC SANATORIA FOR THESE CASES. BERNHARD, Rev. internat. de l'enf. **1**:20 (Jan.) 1926.

During the past forty years, the management of surgical tuberculosis in children has undergone a radical change. Clinicians are now united in the conviction that surgical procedures, radical though they may be, are not sufficient, but must be reenforced with all those hygienic measures which vast experience have proved to be salutary in these cases. Among these agencies, none perhaps is more important than heliotherapy. As early as 1902, Bernhard, antedating the work of Rollier, observed the striking effects of sunlight and mountain air on his little patients. He discusses freely the improvement soon found in these children, an experience now duplicated in many parts of the world, and makes a strong plea for public sanatoriums dedicated exclusively to the care of surgical tuberculosis. The technic of phototherapy and the general conduct of such an institution are described in detail.

AMESSE, Denver.

HUMAN TUBERCULOSIS AT DIFFERENT AGES. TUBERCULOSIS OF SENESCENCE, W. BLUMENBERG, Beitr. z. klin. Tuberk. **63**:13, 1926.

These studies were made on 125 persons, 60 or more years of age at death. Healing of thoracic tuberculosis becomes more frequent with increasing age. The localization of the primary complex is the same as in younger persons. The elastic fibers of the primary focus are less preserved in very old patients, and its fibrotic capsule is more marked. Primary complexes which originated during senescence show little glandular involvement. The foci of reinfection are mostly multiple, and favor the central parts of the upper lobes, not the apexes. Bronchogenic dissemination is the rule; hematogenic dissemination becomes rarer with increasing age. Tuberculosis of the serous membranes, the larynx and the intestines is frequent; the tonsils are less frequently involved. The peculiarities of tuberculosis in old age are not dependent on immunizing factors.

As the result of his entire studies, the author emphasizes the following points: the rule that invading tubercle bacilli always cause pathologic changes at the site of entrance (Baumgarten-Tangl) holds good for thoracic tuberculosis, not for abdominal infections. Tubercle bacilli may pass the intestinal wall and cause a primary tuberculosis of the mesenteric lymph glands without producing any changes in the intestinal mucosa; but this seems to occur in childhood exclusively. Parrot-Cornet's rule, according to which the regional lymph glands of the primary focus always undergo caseation, is true only for childhood. With increasing age the lymph glands show only partial caseation and finally only the formation of cellular tubercles. The anatomic structure of the pulmonary primary focus (caseous hepatization) and its subpleural localization is the same at all ages; it is mostly singular and has a tendency to more apical localization at higher ages; transformation into a small cavity is frequent. Hematogenic dissemination, besides lymphogenic and bronchogenic, is the rule and only in old age is slightly less frequent. Indurative processes are not found during the first year of life; they become more frequent with increasing age. Careful anatomic studies do not lend any support to the generally accepted opinion that a process of immunization modifies the evolution of a tuberculosis, but emphasizes that age is the most important factor to explain the peculiarities of tuberculosis in infancy, childhood, adult life and old age.

MAX PINNER.

CONCERNING SKIN SUSCEPTIBILITY TO TUBERCULIN IN EXUDATIVE DIATHESIS, SCROFULA AND TUBERCULOSIS. H. SCHLACK, Monatschr. f. Kinderh. **32**:248, 1926.

A number of observers have reported that the skin of children with exudative diathesis is more sensitive to chemical irritants than the skin of the normal child. In a series of 204 cases the author tried applying irritants by mechanical means, such as rubbing with a toothbrush, and he also found that increased skin susceptibility occurred four times as frequently in the exudative as in the control group. A certain number of children in the nonexudative group also showed increased reactions. In the tuberculous group, only those with scrofula showed the stronger type of reaction. Obsservers have maintained that scrofula is exudative diathesis plus tuberculosis. The author believes his observations tend to confirm this theory, as tuberculous children free from scrofula reacted as did normal children.

GERSTLEY, Chicago.

CASE OF CONGENITAL SYPHILIS TRANSMITTED TO THE SECOND GENERATION. VANSELOW, München. med. Wchnschr. **72**:1384 (Aug. 14) 1925.

The author reports the eighth case of congenital syphilis in which it may be assumed with fair certainty that congenital syphilis was transmitted to the next generation.

The patient, about 9 months old when first seen by the author, showed the following physical signs: enlarged liver and spleen, hemorrhagic rhinitis, syphilitic exanthem, rhagades and a 4 plus Wassermann reaction.

In the family, the grandmother, aged 65, had fixed pupils; the Wassermann test, however, was negative. Shortly after birth the patient's mother had an exanthem and ulcers, and bowel trouble at from 4 to 6 months. At 1½ years of age, a facial paralysis developed; since then there have been no other signs of syphilis.

The statement that the mother never had any sexual intercourse except with her husband is reliable. The Wassermann test of the mother was 4 plus; the test of the father was negative. The mother's first child died at 5 months of age, with symptoms similar to those of the patient. The mother's sister, who also had an exanthem as a small child, had four consecutive miscarriages. In her case, the Wassermann test was negative.

THE FATE OF PERSONS WITH CONGENITAL SYPHILIS. A. H. HUEBNER, München. med. Wchnschr. **72**:1459 (Aug. 28) 1925.

The author followed up 210 syphilitic families with regard to the fate of the children. Thirteen per cent had no children (this is the same as in non-syphilitic families); 34 per cent had normal and abnormal children; 20 per cent had healthy children only (socially useful). In the majority of the families, stillbirths, miscarriages and living children were born without any rule, that is, often stillbirths and miscarriages succeeded children born living. In the first five years 27 per cent of the children born living died; another 20 per cent showed signs of congenital syphilis up to 18 years of age another 17 per cent had syphilis. After the eighteenth year, only 2 per cent developed symptoms of congenital syphilis, and these symptoms pointed to an involvement of the nervous system only; 34 per cent remained constantly free from gross symptoms. Juvenile paralysis appeared in 7 per cent of the children born living, cerebrospinal syphilis in 4.5 per cent and tabes in 2 per cent.

GROB, Detroit.

Internal Diseases

IRON THERAPY IN THE ANEMIAS OF INFANCY. MURRAY H. BASS and BERNARD S. DENZER, J. A. M. A. **86**:938 (March 27) 1926.

The authors recommend inorganic iron in the treatment of anemias of infants not due to infection or diet, using only saccharated ferrous carbonate in amounts varying from 30 to 60 grains a day. In the prevention of anemia following prolonged milk diet, the use of green vegetables, beef extracts, and liver still has a well established place.

ANGIONEUROTIC EDEMA. ISABEL M. WATSON, J. A. M. A. **86**:1332 (May 1) 1926.

A fatal case of angioneurotic edema involving the larynx is reported in an infant aged 14 months. The necropsy findings were edema of the respiratory tract, with a mild and variable type of cellular reaction. In some sections of the lungs, the character of the response suggests an early inflammation. In other sections of the lungs and the pharynx the picture is not unlike that sometimes seen following protein sensitization; namely, a predominance of mononuclear cells.

BONAR, Salt Lake City.

APPENDICITIS IN CHILDHOOD. W. W. BATTEY, J. M. A. Georgia **15**:189, 1926.

Three cases of appendicitis are reported. The classical symptoms, namely, pain, vomiting, tenderness, rigidity and leukocytosis, are discussed thoroughly.

MASHBURN, Atlanta.

THE RELATION OF THE GASTRO-INTESTINAL TRACT TO PERNICIOUS ANEMIA. A. C. IVY, Northwest Med. **25**:399 (Aug.) 1926.

Ivy reviews the evidence of the occurrence of achlorhydria preceding and during the course of pernicious anemia. Achlorhydria is a frequent sequel of gastrectomy and gastro-enterostomy. Conditions affecting the secretory structures of the stomach cause achlorhydria and later anemia. One theory states that the lack of hydrochloric acid interferes with normal iron absorption. Another theory, more widely accepted, states that the achlorhydria permits the growth in the stomach and upper intestine of organisms whose toxins are hemolytic. The author recommends treatment with iron, cod liver oil, ultraviolet light and hydrochloric acid, the latter flavored with fruit syrups or in milk.

CONGENITAL MIXED TUMOR IN KIDNEY REGION: REPORT OF A CASE. L. HOWARD SMITH, Northwest Med. **25**:436 (Aug.) 1926.

The case reported is that of a girl, aged 17 months, with anemia, malnutrition and a mass in the left upper quadrant, extending 4 cm. below the costal margin. Birth was slightly premature; the weight was 6 pounds (2.7 Kg.). She was breast fed for ten months, and weighed 14 pounds (6.4 Kg.) at 6 months. The present weight is 15 pounds (6.8 Kg.). When 1 year old the child had pertussis, and was treated with four injections of pertussis vaccine. The tumor was first noticed at the time of a gastro-intestinal upset four weeks before examination. The urine has always been normal. A tumor, thought to be the spleen because of its extension below the costal margin, was found. One and a half months after the onset, bulging of the left eyeball appeared,

soon followed by bulging of the right eyeball of a lesser degree. Blindness occurred one month before death. A roentgenogram showed a growth at the base of the skull, and metastatic growths on the skull and right lower jaw. Necropsy showed a small round cell primary sarcoma in the retroperitoneal region and a general sarcomatosis. The Wassermann reaction was negative. Hemoglobin content was 55 per cent; red blood cells, 4,704,000; white blood cells, 15,000; polymorphonuclears, 53 per cent and lymphocytes, 43 per cent. The stools were normal.

SCOTT, Philadelphia.

HIRSCHSPRUNG'S DISEASE WITH OPTIC ATROPHY AND OLD CHOROIDITIS. C. WORSTER-DROUGHT, Proc. Roy. Soc. Med., Section for the Study of Disease of Children **19**:11 (Dec.) 1925.

The author reports a case of Hirschsprung's disease in a girl aged 8 years, the enlargement of the abdomen not taking place until the patient was past 5 years. This supports the view that Hirschsprung's disease is not congenital. The author had never seen a case associated with optic atrophy, nor had he heard of one, and wonders if the occurrence in this patient was purely accidental.

WILLIAMSON, New Orleans.

CONGENITAL HYPERTROPHIC STENOSIS OF THE PYLORUS. BASIL HUGHES, Practitioner **116**:351 (May) 1926.

The earliest reported case of this condition was described by Bardsley in 1788, to be followed 100 years later by Hirschsprung. Apparently, it is becoming much more frequent, although probably this is due to early recognition. Two classifications are made: (1) Pylorospasm with excessive hypertrophy of the pyloric muscle; (2) polorospasm with moderate or little hypertrophy of the pyloric muscle. Between the two headings occur various degrees.

Pathologically, the pylorus seems to be elongated, and enlarged transversely. It is very hard and the canal practically occluded. The musculature of the pyloric antrum is especially marked. Apparently the condition appears almost exclusively in boy babies, usually in the firstborn and in those most healthy. The author gives the period of onset of symptoms at the tenth to the seventeenth day. Projectile vomiting, constipation, rapid loss of weight, peristaltic waves from left to right, and a palpable tumor are the cardinal symptoms and signs in the first group. In the second group, vomiting is more irregular, although projectile. There is more of a residue in the stool and more gradual loss of weight and an inconstantly palpable tumor.

As to etiology, Thompson suggests that the hypertrophy is secondary to congenital gastric spasm, while Cautley believes the hypertrophy to be primarily due to pyloric overgrowth. It is the author's opinion that in the first group, the hypertrophy is antenatal, and to much less extent the same is true in group 2. The additional element of spasm of an already hypertrophied structure initiates the symptoms. He feels that the greater frequency of pyloric spasm is in adult males and believes that it is only part of the general condition of irritability affecting the whole of the intestinal tract.

The diagnosis is simple. The prognosis is good, provided the baby is not below 5 pounds in weight, has not been weaned and that treatment can be carried out in private. Under 5 pounds, he feels that acidosis is present to no great degree. Mother's milk is essential, postoperatively. In his experience, patients treated in children's wards have done badly. As regards operation, the one of choice is Rammstedt's.

In the second group, gastric gavage combined with small feedings should be resorted to as long as weight is not lost or shows a slight increase. Otherwise, operation should be performed at once. Belladonna in small doses is also used. It is Bardsley's experience that, due to general intestinal irritability, often after operation, babies stools show that food is indigested, failure to gain and an ensuing diarrhea, acidosis and death. In case it has been impossible to have breast milk, the best temporary feeding is sherry wine whey sweetened with glucose. Subcutaneous injections of sea-water plasma (50 cc.) are given every third day, together with small doses of atropine. The baby is later given citrated cow's milk with barley water and a teaspoonful of raw meat juice added. Dried milk and condensed milk he finds unsatisfactory.

In summarizing his cases of Rammstedt's operation on forty-five consecutive subjects (forty-three males and two females), forty-three occurred from the tenth to the seventeenth day after birth; two at the tenth week, the latter being both in females and both of whom recovered. Thirty-two patients recovered and thirteen died, showing a mortality of 30 per cent. Of the thirty-two recoveries, twenty-one were breast fed after operation. Of the thirteen deaths, all were males and all were fed artificially.

GELSTON, San Francisco.

MORPHOLOGY OF BLOOD AS AID IN DIAGNOSIS IN INFANCY. EUGEN STRANSKY, Wien. klin. Wchnschr. **39**:865 (July 22) 1926.

On the basis of selected case reports, Stransky presents evidence to show the value of microscopic examination of the blood in infants having some hidden acute infection (osteomyelitis, pyelitis, meningitis, etc.). Relative or absolute neutrophilia directs attention to an infecting focus before objective signs become clear. Progressive anemia and absent or decreasing neutrophilia indicate a toxemia or poor reactivity of the hematopoietic apparatus and a bad prognosis. Progressive anemia is present in pyemia with pyodermia, it is absent in uncomplicated pyodermia. In erythrodermia exfoliativa, increasing leukocytosis and progressive anemia are prognostically unfavorable. Eosinophilia suggests exudative diathesis even in the absence of cutaneous lesions. In patients having cough of doubtful nature, relative lymphocytosis points to pertussis as the cause. A shifting to the left in Arneth's formula differentiates parenteral infection from simple nutritional disturbances.

OLMSTED, Seattle.

HEREDITARY PSEUDOHEMOPHILIA. E. A. VON WILLEBRAND, Finska lak.-sallsk. handl. **68**:87, 1926.

Willebrand describes a family with not less than twenty-three bleeders among the sixty-six members in four generations. The coagulation time was normal, but the bleeding time was extremely long in the grave cases, and the Rumpel-Leede phenomenon — minute subcutaneous hemorrhages below rubber bandage

to upper arm for ten minutes — was pronounced. The clinical picture resembled that of Weil's disease although certain features differed, suggesting some functional disturbance in the thrombocytes plus a general lesion of the vessel walls. The thrombocytes numbered from 55,000 to 450,000. The eosinophils ranged from 1 to 14 per cent, the lymphocytes from 25.3 to 61.3 per cent, and the neutrophils from 35 to 65.4 per cent. It is questioned whether this may not represent a new nosologic type of hemorrhagic diathesis. The graver forms were in women and proved fatal in five. None of the male members died from this cause. Transmission seemed to be in the female line. Nineteen cases on record are summarized.

[ARCH. PATH.]

Nervous Diseases

BLOOD CALCIUM IN SPASMOPHILIA. J. P. CROZER GRIFFITH, J. A. M. A. **86**:828 (March 20) 1926.

The author agrees that within certain limits there is, in spasmophilia, a distinct lowering of the percentage of the calcium in the blood; but as to just how this is brought about and just what its actual influence is, there is lack of positive knowledge. He admits that the influence of the parathyroid glands, and perhaps some other endocrine glands, is a powerful factor in some cases of tetany, and the same is true of certain gastric disturbances and alkalosis; but whether this tetany is the same in ultimate origin as the infantile tetany of spasmophilia does not appear as yet to be decided. The administration of calcium in large doses will usually promptly control tetany, which is one of the chief manifestations of spasmophilia; yet its action is only a temporary one, indicating that there is some concealed cause which is maintaining the reduction of blood calcium. Cod liver oil is to a large extent a specific, although its action is often slow, while the employment of ultraviolet rays has a similar and much more rapid effect in restoring the normal hemic condition; but what relationship exists between these two measures has been hard to explain. Two cases are reported which illustrate that it is probably only the ionized calcium that plays a part in the production of tetany. What is especially to be noted is that whereas a diminished blood calcium is nearly always present in infantile tetany, yet spasmophilia with definite active manifestations may be present in early life with a practically normal blood calcium and that, therefore, the ultimate diagnosis cannot be based on the blood calcium alone.

BONAR, Salt Lake City.

A COMPARATIVE STUDY OF VARIOUS METHODS OF THE ADMINISTRATION OF PHENOBARBITAL IN EPILEPSY. H. A. PATTERSON, LEGRAND A. DAMON and P. LEVI, J. Nerv. & Ment. Dis. **63**:446-455 (May) 1925.

The authors tried various methods of phenobarbital administration to 300 epileptic subjects, and the following observations were noted: Given orally, the drug seems more efficient in reducing the number of severe than the mild attacks of epilepsy. Dull, surly patients become more cheerful, cooperative and efficient. When mental deterioration had begun, the process seemed checked in those cases in which the number of seizures was lessened. There appeared to be a diminished necessity for the drug, and if withdrawn abruptly a state of status epilepticus may occur.

Hypodermically, the sodium preparation was used, the response being favorable except during status epilepticus. Intravenously, the same salt gave a

rapid response to the latter condition and only in this was it efficient. By the intraspinous route no definite value was determined except to stimulate a response to the drug by other methods of administration.

It is pointed out that phenobarbital treatment is only palliative.

FLOYD, Iowa City.

CELIAC DISEASE. JULIUS R. HESS, Northwest Med. **25**:285 (June) 1926.

Hess, in a general article on celiac disease, discusses the incidence, etiology, pathology, symptoms, prognosis and treatment. The dietetic management is treated at length, and the views of Howland, Sauer, Marriott, Haas and Hess are explained. This is a textbook article, to which the reader is referred.

SCOTT, Philadelphia.

GOITER IN CHILDREN. H. D. KITCHEN, Canad. M. A. J. **16**:923, 1926.

The author has made a careful clinical study of the results of treatment in goiter of children. A short, but complete résumé of the present day knowledge of anatomy, physiology and pathology of the thyroid is given.

In Canada, adolescent goiter and goiter in children are regarded as colloid goiters, in which the principal departure from the normal histologic structure is a distention of the alveoli with colloid and probably some flattening of their epithelium. In Europe, the adolescent goiter is not, as a rule, of the colloid type, but is characterized by a hyperplasia of the alveolar cells and a lack of colloid in alveoli.

In the present study, a series of cases in which the patients were up to 16 years of age was treated with desiccated thyroid. Another group was treated with iodine, given orally as Lugol's solution, while a third group was given no treatment.

Summary of Effect of Treatment

No. of Cases All Ages up to 16	Treatment	Degree Improvement in Percentage None	Slight	Marked	Total
24	Thyroid	16.6	45.8	37.5	83.3
24	Iodine	37.5	37.5	25.0	62.5
24	Controls	83.3	8.3	8.3	16.6

The author's conclusions are:

1. Desiccated thyroid, in safe doses, produce a greater number of marked improvements and less failures than iodine or the expectant therapy.

2. There were no cases of iodine hyperthyroidism as a result of the use of iodine.

3. Desiccated thyroid, used in small doses (from 1 to 2 grains daily) produce no untoward effects, though given continuously for several months. The patient should be under careful observation for toxic symptoms, however.

4. Treatment is important. The size of thyroid may not be reduced, but further enlargement may be prevented.

5. Prevalence of thyroid enlargement in children is serious. One out of every twenty goitrous mothers give birth to mentally defective or imbecile children (McCarrison), and the goitrous girls of today are the goitrous mothers of tomorrow.

These final conclusions of the author are not based on his work in these cases, and future work may modify these statements considerably.

MOORE, Omaha.

A Peculiar Reflex Phenomenon. P. M. Van Wulfften Palthe, Brain **48**:476, 1926.

This experimental study was suggested by the "feeling of suffocation and gasping for breath, accompanied by a curious sensation in the throat which occurs when a strong current of air strikes full in the face." The author experimented with certain forms of stimulation to that part of the skin and mucous membrane supplied by the second branch of the trigeminal nerve. He found he could elicit a reflex resembling in many respects the swallowing reflex, and consisted of "(*a*) Arrest of breathing in any phase. (*b*) Movement of the floor of the mouth and of the root of the tongue. (*c*) Movement of the larynx. (*d*) Increase of pressure in the nasal cavities." He believes that this "reflex swallow" may have localization value in distinguishing between disorders in the trigeminal sensibility of peripheral origin, and those due to more centrally situated lesions above the linking center of these cerebral nerves. The article is accompanied by a number of tracings of movements of the larynx, etc., and a bibliography.

The Rotated or "Cerebellar" Posture of the Head. W. Russell Brain, Brain **49**:61, 1926.

This study is based on sixteen cases (seven under 16 years of age) in which the rotated or "cerebellar" posture of the head was noted. The article contains a review of the literature, summaries of the cases, a discussion of the physiologic and clinical significance of this symptom, and a bibliography. Following are the diagnoses on the children's cases, five of which were confirmed by necropsy: Glioma, pyemic abscess and metastatic sarcoma of the pons, cystic glioma of the right and left cerebellar hemisphere, tuberculomas in the right cerebellar hemisphere and in the temporosphenoidal lobe. The author summarizes his findings as follows: "1. The rotated posture of the head is the result of interference with a tonic reflex in which the extensor muscles of the neck, under the influence of impulses from the labyrinths, are maintained in a state of tonus adequate to resist the effect of gravity on the head. 2. Experimental destruction of one labyrinth, or section of the eighth nerve on one side, leads to rotation of the head to the affected side. Lesions within the pons, midbrain or forebrain may lead to rotation of the head either to the affected or to the normal side, according to their situation. Lesions confined to the cerebellum do not lead to the rotated posture of the head. 3. Clinically, it has been found that a unilateral otitis interna or an acoustic nerve tumour lead to rotation of the head to the affected side. This is attributed to interference by these lesions with impulses from the labyrinth on the affected side. 4. Lesions of the pons and midbrain have been found in five cases to lead to rotation of the head to the normal side. 5. Tumors of the cerebellum may lead to rotation of the head either to the affected or to the normal side. It is suggested that the former effect is due to pressure on the homolateral eighth nerve, and the latter, which occurs in more advanced cases, to compression of the pons and medulla on the affected side.

The Function of the Right Hemisphere of the Brain in Relation to the Left in Speech, Music and Calculation. S. E. Henschen, Brain **49**:110, 1926.

Henschen (author of *Pathologie des Gehirns,* Stockholm, 1922) discusses the doctrine of aphasia, and of the localization of this symptom in the left third frontal convolution (Broca's convolution, because Paul Broca first demon-

strated this fact) though he does not consider this a constant finding. He cites authorities for and against this view. Speech, agraphia, sensory aphasia, word-blindness, music, motor forms of amusia, sensory amusia and calculation are discussed as to localization of function, and the substitution of the right hemisphere for the left when the latter is damaged. The author believes that the right can best act as a substitute in the hearing and speaking of words, but that this capacity is less developed for reading and writing. The musical faculty, because older than speech, is more uniformly distributed over both hemispheres, and the right can more easily take over the musical function of the left when damaged than in the case of speech. He concludes that in nature "there seems to be a law that in order to attain full development of higher faculties originally distributed over two organs, a concentration of the capacity in only one of them is necessary. Development in nature always depends on the differentiation of a pre-existing faculty."

LUCAS, San Francisco.

A REVIEW OF FOURTEEN CASES OF POSTENCEPHALITIC PERVERSION. HEUYER, Arch. de méd. d. enf. **29**:249 (May) 1926.

Mental disturbances following epidemic encephalitis seem to be increasing. Within five months, Heuyer found fourteen of these subjects in the neuropsychiatric Clinic for Children (Paris), which would seem to indicate that these distressing sequelae are as common among the young as among those of adult age. As a matter of fact, in the adult, one finds more psychomotor and confusional disturbances than true perversions. These postencephalitic complications in children may be classified under two heads:

1. Impulsiveness, rudeness, truancy, incorrigibility, lack of discipline, outbursts of temper with violence, resembling certain mental reactions seen in epilepsy except that in the former the patients are entirely conscious and oriented.

2. In this group one notes elements of reflection, premeditation and utilitarian interest often malignant and most tenacious in character.

In three of the cases reported, a distinct parkinsonian syndrome preceded the perversions. It is admitted that encephalitic parkinsonism is a distinct clinical entity rather than a sequel of encephalitis, Guillain reporting a case of the latter traced directly to a patient suffering from Parkinson's disease. Heuyer, also, reports a similar case in a girl, aged 4 years, the infection having been incurred while living with her father, who had been suffering with Parkinson's disease for several years. Another case, studied at the Hospital for Sick Children for a period of six months, showed first, a confusional, dreamy state, then a parkinsonian syndrome with hypertonia, trembling, bradycardia and bradypsyche and finally a stage of great mental agitation with gross misbehavior. The child left the hospital, following an attack on a dying typhoid patient. An attempt was made to readmit the child, but the parents objected. A few days later he was arrested for theft at Versailles and became the object of a spirited medicolegal controversy.

In another instance, a boy arrested for vagrancy and theft exhibited clonic contractions of the pectoral muscles and had periods of somnolence. In a further subject, stricken with encephalitis in 1922 and showing striking changes in character in 1923, instability is now most prominent, the patient changing her occupation more than thirty times. She has had attacks of somnolence during the day and was finally readmitted to a general hospital ward, the neighboring bed being occupied by a pregnant woman. The latter patient, on being removed

to the Boncicaut Hospital, developed encephalitis, and Heuyer believes that the infection could logically be traced to the original case. The development of this behavior complex and the tendency to perversions are not understood. Once noted, they are rarely if ever cured, in spite of the assertion of Tinel that with combined medical and pedagogic treatment some patients can finish school and engage in social activities. As a matter of fact, it is not so much the intelligence of a child that is affected as his powers of concentration and attention. The management of these patients should not be attempted either in the home or in the school. Their lack of discipline, their gross misconduct and their utter moral deterioration constitute a grave menace to brothers, sisters and school comrades alike. Neither should they be admitted to an institution except those dedicated to chronic cases alone; since they are quite unamenable to training, they cannot be sent to prison nor to a delinquent home because they are sick. The best solution would be to confine them in an isolation ward of the psychopathic hospital, equipped with manual training and proper vocational instruction.

AMESSE, Denver.

INJURIES TO THE CENTRAL NERVOUS SYSTEM FROM VACCINATION. FRANZ LUCKSCH, Deutsche Ztschr. f. ges. gerichtl. Med. **7**:203, 1926.

Following vaccination there may arise disturbances in the central nervous system in the form of serous meningitis, of encephalitis with tetanus-like symptoms or with somnolence or paralysis of the eye muscles, and as lesions of the cord with the picture of anterior poliomyelitis. The mortality in the encephalitis cases may be high. The microscopic appearances in the encephalitis forms differ from those of epidemic encephalitis, particularly by the extensive participation of glia in the infiltrations and also because the white substances are involved in the inflammatory changes. The interval between vaccination and the development of the changes in the central nervous system is about ten days. The conditions about the point of vaccination appear to bear no relation to eventual nervous disturbances.

[ARCH. PATH.]

THE CRAWLING PHENOMENON OF THE NEW-BORN. J. BAUER, Klin. Wchnschr. **5**:1468, 1926.

When a firm object is placed against the soles of an infant, with the infant lying on his abdomen, an attempt at crawling follows, in which the upper extremities take active part. This phenomenon occurs not only in the new-born infant but up to the fourth month. After this time it disappears even if the performance has been practiced. It will not occur in extremely sick infants. The phenomenon is part of an instinctive mechanism comparable to the act of sucking when the lips of the baby are touched.

SCHWARTZ, Milwaukee.

THE PRESENCE OF FAT IN THE BRAIN OF FETUSES AND NEW-BORN ANIMALS. J. BERBERICH and R. BAER, München. med. Wchnschr. **72**:1284 (July 31) 1925.

The much discussed question of whether the brain of the fetus or new-born infant contains any fat or lipoid substance is taken up by the authors. After examining fifty-six brains, some from fetuses, some from new-born animals, they come to the conclusion that the substance proper does not contain any fat in any stage of the development. They found fat only in the perivascular

tissue and in the pia cells. Injuring the brain of five new-born animals and killing them from three to six days afterward, they found fatty deposits in the glia cells similar to those in new-born children with birth trauma. This confirms Schwartz' theory, namely, that fat in the brain substance of new-born children is always pathologic.

GROB, Detroit.

THE GROWTH IN LENGTH AND WEIGHT OF FEEBLEMINDED CHILDREN. ALEXANDER ROSENBLÜTH, Ztschr. f. Kinderh. **40**:281, 1925.

The curves of standing height compared to age, and of weight compared to height, were charted by Rosenblüth from the measurements of 393 children in three institutions for the feebleminded. These children are always below height compared to children with normal mentality, and, for their height, are underweight. This is true for both boys and girls, but does not mean that they are in good condition physically. As they grow older the deviation from the normal weight and height is not progressive.

EMERSON, Boston.

TONIC SPASMS OF THE EYE MUSCLES IN EPIDEMIC ENCEPHALITIS. NINA POPOWA, Ztschr. f. d. ges. Neurol. u. Psychiat. **97**:515 (July) 1925.

The author's conclusions, based on five cases of ocular spasm in post-encephalitic parkinsonism, may be summarized as follows: attacks of tonic spasm of the eye muscles were observed; these spasms affected most commonly the muscles which move the eyeballs upward, and less often those which move them downward or laterally; in a few cases the spasms were tonic, in others tonic-clonic, and in others they consisted of a series of short, rhythmic tonic spasms; the spasms ceased during sleep; the seat of the affection is in the corpus striatum; atropine and epinephrine shorten the spasm, and the effect of these drugs is in favor of the parasympathetic origin of the convulsions.

ALPERS, Philadelphia.

Diseases of the Eye

EPIDEMIOLOGIC STUDY OF VISCERAL LEISHMANIOSIS IN SPAIN. G. PITTALUGA, Ann. d'ig. **36**:259-284, 1926.

Visceral leishmaniosis, or infantile kala-azar, is endemic in many scattered areas throughout the Spanish kingdom. Infants and children are most commonly affected, but many cases have been diagnosed in adults. More cases are being recognized now than formerly because of better diagnostic standards and on account of an almost specific therapy. Of the 343 cases forming the basis of this report, 57 per cent occurred in females and 43 per cent in males. The majority of the cases are among the poor, but many patients belong to the well to do classes. It is therefore a question of sanitary living. Most of the persons affected are residents in rural communities, where sewage disposal is very poor and domestic animals are abundant. Dogs and other domestic pets play an important part in the transmission of the disease. The infection of a human being does not always depend on infection through dogs, but it is very possible that they are often infected from the same common source (fleas, body lice, bed bugs, etc.).

Many cases of cutaneous leishmaniosis have been reported in the Spanish literature, but the author found none in his series. Many cases of kala-azar were formerly looked on as essentially malignant in character and the prog-

nosis poor. But now conditions have changed. The diagnosis is made earlier, and therapy has been so much improved that in some patients it follows a rather benign course. While patients usually present a typical habitus and facies, and the clinical picture is rather characteristic, a positive diagnosis should never be made unless *Leishmania* is isolated from the spleen through splenopuncture. The procedure in most cases is free from inconvenience. The serologic tests of Brahmachari and Napier are interesting, but not always conclusive. The only feature in the blood picture of any clinical value is the constant leukopenia. Treatment with sodium and potassium antimony bitartrate is most efficacious. The reported percentages of cures with this form of therapy range from 60 to 85 per cent. A very extensive bibliography is appended.

ZAMBARANO, Northville, Mich.

Diseases of the Ear, Nose and Throat

THE RESPIRATORY FACTOR IN THE POSTOPERATIVE TREATMENT OF TONSILS AND ADENOIDS. J. DUNLOP LICKLEY, Practitioner **116**:359, 1926.

Cases of tonsils and adenoids are divided into two types: (*a*) the obstructive type in which the symptoms of mechanical obstruction predominate; (*b*) the toxic type in which the main symptoms arise from toxic absorption.

The ordinary case combines various degrees of both elements. In the obstructive type, the causation of the chest disturbance seems fairly obvious. Particularly to be noted is that air drawn through the mouth is colder, dryer, and more dusty than when properly inspired through the nose, thus starting up spasm of the bronchial muscles. With less air allowed to enter the lungs, there is a resulting failure of the chest to expand properly and a chronic bronchial catarrh supervenes.

In cases of simple septic tonsils, the muscle tone is usually good, but when there is adenoid hypertrophy, muscular flabbiness is the rule. Pigeon breast and funnel breast are the commonest deformities. After operation, the deformities are considerably improved.

Nose breathing exercises, as suggested by Handcock and Hickling, are of value. In the toxic type, striking respiratory alterations are demonstrable. There is, apparently, easy breathing through the nose, but when the children are undressed, defects are very evident. The upper chest is narrow, flattened and looks sunken, due, probably, to drooping and rolled shoulders. The abdomen is prominent and pendulous; frequently there is some degree of lordosis. Naturally, postoperative treatment must include an attempt to overcome this muscular disability. Rest in bed is of value, physical exercises, massage, and the so-called respiratory exercises are also of value.

1. The authors base their exercises on the vertebral part of the diaphragm, and with this combine some exercises for strengthening the abdominal muscles. These are done at first with the child in the supine position.

2. Practice these in the erect posture and then proceed to exercise the costal part of the diaphragm.

3. Correct the general stance.

Breathing must be carried on through the nose, using at times both nostrils and at other times each nostril alternately.

Regularity of performance and intelligent appreciation of the exercises are all important. When one remembers the direct and far-reaching effects

of respiration on the circulatory system and on the abdominal viscera, one must realize its great importance as a factor in the nutrition and development of these cases.

GELSTON, San Francisco.

SINUS THROMBOSIS IN INFANCY. OSCAR HERZ, Monatschr. f. Kinderh. **32**:256, 1926.

This is a pathologic and clinical study of ear conditions in infancy. Otitis media occurs more frequently in early infancy than is generally known, this being due, according to the author, to birth injuries involving the middle ear and forming foci of diminished resistance. Sinus thrombosis was encountered in two infants. Such a complication is almost always overlooked. In sinus thrombosis metastases occur almost exclusively in the lungs. The pulmonary symptoms overshadow the others, and if sinus thrombosis is diagnosed or discovered at necropsy, it is considered a complication and not the primary cause.

GERSTLEY, Chicago.

Diseases of the Skin

ACRODYNIA WITH REPORT OF SIX CASES. WILSON POWELL, Boston M. & S. J. **194**:980 (May 27) 1926.

All of the subjects showed some of the classical symptoms of acrodynia including loss of appetite, restlessness, photophobia, assuming of peculiar attitude in bed, reddish maculopapular rash with later desquamation on body and extremities, and definite areas on palms of hands and soles of feet, accompanied by swelling (so-called "beefy hands and feet"), hyperirritability, paresthesia, stomatitis, and loss of weight. There is usually a history of upper respiratory infection. The etiology, pathology and treatment of the disease as reported by other observers is also discussed.

GENGENBACH, Denver.

TREATMENT OF PYODERMIA. E. ODIER AND S. DREYFUS, Nourrisson **13**:44 (Jan.) 1926.

Attention is called to the frequency of pus infections of the skin in infants and the difficulty of clearing up these infections with the accepted methods of treatment. Bacteriologic studies show that most of these infections are due to a staphylococcus. Vaccines were prepared by allowing bouillon cultures to grow for from eight to twelve days. Filtration is accomplished through a Chamberland candle, and the filtrate is heated to 80 C. This is then applied directly to the infected areas in the form of wet dressings, which are covered to prevent evaporation. Fresh applications of the filtrate are made twice in twenty-four hours. If applied early, abscesses can often be aborted; if applied later, pointing is hastened. In cases of widespread deep infection, subcutaneous injections of the filtrate are often of decided help. The vaccine should always be autogenous. Two cases in point are related.

MCCLELLAND, Cleveland.

SULPHUR POISONING IN INFANTS RESULTING FROM THE USE OF SULPHUR OINTMENT IN SCABIES. FELIX BASCH, Monatschr. f. Kinderh. **32**:239, 1926.

Basch reports two deaths in nurslings resulting from the use of a 10 per cent sulphur ointment used in the treatment of scabies. Within twenty-four hours the patients developed symptoms resembling alimentary intoxication,

with increasing loss of weight, fever, diarrhea and death in from one to three weeks. Necropsy revealed nothing characteristic. In experimenting with guinea-pigs, it was found that if their skin was excoriated sulphur ointment was uniformly fatal, the animals dying with hydrogen sulphide in the blood and urine.

This preparation should be used with care in infants.

THE BENEFICIAL EFFECT OF THE WARMESCHIRM (MOLL) IN THE TREATMENT OF SKIN CONDITIONS IN INFANTS. MARIANNA ALLINA, Monatschr. f. Kinderh. **32**:400, 1926.

Apparently Professor Moll has made some modification to the carbon lamp, and is treating his patients who have eczema and other dermatoses by exposure to the rays. This is a clinical report claiming benefit from the treatment. The itching seemed greatly improved and the inflammation milder.

GERSTLEY, Chicago.

EPILATION BY THALLIUM ACETATE IN FUNGUS DISEASE. GÉZA PAUCHLY, Wien. klin. Wchnschr. **39**:948 (Aug 12) 1926.

Pauchly employed Fiocco's method of epilation in fourteen children having fungus disease of the scalp (favus, trichophytosis, microsporon infection). A single dose of thallium acetate was administered per os, 8 mg. per kilogram of body weight in 25 cc. of water. Epilation began in from ten to fourteen days, and was complete in from twenty to twenty-six days. Complete alopecia lasted from ten to twelve days, during which time the scalp was treated by local applications of tincture of iodine, 0.5 per cent red sulphide of mercury, and 10 per cent sulphur ointment. Cure was obtained in all cases. The hair had completely regrown in fifty to sixty-two days after administration of the thallium acetate. No toxic effects from the drug were seen.

While the employment of the roentgen ray for epilation is always followed by scarring and atrophy of the scalp, these undesirable effects are never seen after the use of thallium acetate. A further advantage of the latter method is its cheapness and simplicity.

OLMSTED, Seattle.

Surgery and Orthopedics

SURGICAL CONVALESCENCE: MEDICAL ASPECTS. J. BRYANT, Boston M. & S. J. **194**:920 (May 20) 1926.

This article is a masterpiece of helpful suggestions, useful to every physician, general practitioner and specialists of all kinds as well, not excluding the surgeons. It emphasizes closer cooperation between the surgeon and the physician by whom the patient is referred, looking toward better preoperative preparation and postoperative treatment, in order that the patient may be a better operative risk, mentally as well as physically prepared for the ordeal; made as comfortable as possible immediately after the operation; and given every aid through convalescence, including sufficient time, toward making a complete recovery. In the latter connection, reference is made to the observations of Bridgman in his convalescent camps during the war that both the medical and surgical subjects, after being in the hospital for an average of three weeks, required at least that same additional time of convalescence before being ready for active duty.

Preoperatively, emphasis is laid on attention to local infections, neuromuscular training, diet, sleep and general comfort until under the anesthetic; postoperatively, to the control of the nervous system, nausea and vomiting, first night after operation, small pillows, massage, sleep, diet, avoidance of fatigue and building up reserve strength, in all of which the physician is most helpful as he best understands the patient's condition.

HARELIP AND CLEFT PALATE. W. E. LADD, Boston M. & S. J. **194**:1016 (June 3) 1926.

This paper is based on a study of 400 subjects operated on by the writer, and 262 subjects operated on by other members of the surgical staff of the Children's Hospital. Fifty-nine per cent of the subjects were males, and 41 per cent were females. In 55 per cent the deformity occurred on the left side, in 29 per cent on the right side, and in 16 per cent double. One patient lacked the intermaxillary bone.

The writer believes "the restoration of the alveolar line is obviously an essential for an adequate operation on the lip. The first procedure, therefore, is to push the intermaxillary bone into its proper position. The younger the patient the easier it is to accomplish this. As a practical matter, it rarely means that the operation can be done much before the third week." (p. 1018.) "The operation can be very easily done up to the third or fourth month, but there is nothing to be gained by waiting this long, and the chance of the infant not thriving is sufficiently great to make it undesirable to wait." (p. 1019.) "The time of choice for the palate operation is from 18 months to 2 years" (p. 1019). One thus gains a certain amount of narrowing of the cleft, both from the first operation and from the growth of the parts, and the child begins talking with a restored palate.

Both operations are explained in detail and with many illustrations. Preoperatively (p. 1019) "it is of paramount importance that the infant be in good general condition; that his feeding agree; that he has no upper respiratory infection or infection of the middle ear. It is wise to make sure of the absence of diphtheria by culture before operation, and to be sure that the skin is in a healthy state, free from such diseases as eczema and furunculosis. It is always desirable to keep the young infants in the hospital for a day or two before operation to ascertain their general condition and to force fluids by clysis or by rectum if there is any tendency toward dehydration." (The abstractor also has a preliminary roentgenogram of thymus and chest.)

"Postoperative care (p. 1024): Glucose by rectum is given on the operating table as a safeguard against acidosis. A sufficient amount of morphine for the first two or three days is given to limit amount of fussing. The patient is fed with a medicine dropper with an inch of rubber tubing on the end, and given sterile water after and in between feedings."

The operative mortality for harelip was 2 per cent, and for cleft palate was 3 per cent.

GENGENBACH, Denver.

GALLSTONES IN CHILDREN. J. D. CAREY, J. A. M. A. **86**:1209 (April 17) 1926.

The writer reports finding an oval stone 2.5 cm. in diameter in the gallbladder of a girl, aged 9 years and 3 months. The gallbladder was removed.

BONAR, Salt Lake City.

Miscellaneous

STATISTICAL REPORT OF INFANT MORTALITY FOR 1925. American Child Health Association, June, 1926. (Death Registration Area.)

The cities of Idaho had the lowest infant mortality rate for 1925 among nine states of the limited registration area. The eight other states in this comparison are Alabama, Arkansas, Georgia, Louisiana, Missouri, South Carolina, Tennessee and Texas. This announcement was made today by the American Child Health Association, New York City, which publishes an annual report on infant mortality.

These states, as a whole, or certain cities within them, have met the requirements for inclusion in the Death Registration Area of the United States, but incompleteness in birth reporting prevents their admission to the Birth Registration Area of the country. There are seventy-five such cities, and the recent report includes returns from sixty-five.

The average infant death rate for the two cities reporting from Idaho is 58. This means that of every thousand babies born in 1925, 58 died during the year. Missouri's thirteen cities had an average rate of 76. The average rate for two cities in Arkansas and for ten cities in Alabama is 81.

The lowest infant death rate reported for any city in this territory was 57 for Boise, Idaho. Among cities of over 250,000 population, St. Louis, Mo., was lowest with a rate of 67. In the group from 100,000 to 250,000, Fort Worth, Texas, was lowest with 76. Little Rock, Ark., with a rate of 75, and Montgomery, Ala., with a rate of 58, led in their respective population groups, 50,000 to 100,000, and 25,000 to 50,000.

The Birth Registration Area of the country consists of thirty-three states and the District of Columbia. There are 641 cities of 10,000 or more population in the 1920 census included in this area.

The statistics issued by the American Child Health Association are based on records of the United States Census Bureau, supplemented by preliminary returns from state and local registrars. The report is published annually with the object of interesting the entire country in the reduction of infant mortality and the necessity for complete birth registration

STATISTICAL REPORT OF INFANT MORTALITY IN UNITED STATES CITIES FOR 1925. American Child Health Association, June, 1926. (Birth Registration Area.)

The record low rate for infant mortality attained in 1924 by cities of the United States lacked a fraction of a point of being equalled in 1925, according to the report issued by the American Child Health Association, New York City. The reports for 632 cities, having populations of 10,000 or over in 1920, show that for every thousand babies born in 1925, seventy-three died during the year. The exact rate was 72.6, as compared with 72.2 in 1924.

The report relates to the cities within the Birth Registration Area of the United States, which includes thirty-three states and the District of Columbia. This area was first established in 1915, and then consisted of only ten states in addition to the District. States admitted are those in which the United States Census Bureau finds a reporting efficiency of 90 per cent or better. There are now 641 cities included in this area, and the figures given in the foregoing are based on the returns from 632 cities, which represent over 99 per cent of the urban population of the area.

Stonington, Conn., and Winona, Minn., achieved the lowest rates of all cities, the figure being 32. These cities are in the group having populations of 10,000 to 25,000 in 1920.

Of the largest cities, those of 250,000 population or more, Seattle, Washington, was lowest with a rate of 45. For more than four years Seattle has had the lowest rate among the large cities. In the large population group, two other west coast cities were among the lowest three, namely, Portland, Ore., 46, and San Francisco, Calif., 55. The rates for the ten largest cities of the Birth Registration Area were: New York, 64; Cleveland, 66; Los Angeles, 67; Chicago, 75; Philadelphia, 77; Detroit, 77; Baltimore, 82; Pittsburgh, 82; Boston, 85; Buffalo, 86.

Salt Lake City, Utah, was lowest in the population group from 100,000 to 250,000, with a rate of 45.

In the group of cities from 50,000 to 100,000, Union City, New Jersey, led with a rate of 38. This low rate, it is stated, is due to the absence of hospitals, many deaths in babies' occurring outside of the city. The corrected rate for Union City furnished by the state was 70. The next lowest city in this population group was Brockton, Mass., whose rate was 39.

Oak Park, Ill., with a rate of 35 was lowest in the group from 25,000 to 50,000.

The rates for the municipalities of over 10,000 population show that the cities of Utah lead with a composite rate of 47. The cities of Oregon are second with a rate of 48; the cities of Washington third with 50; cities of North Dakota and Wyoming fourth, each with rates of 51.

The urban records of fifteen states show reductions in infant mortality in 1925, as compared with 1924. A year ago, twenty-six states showed declines in urban mortality over the preceding year.

When grouped by size the cities with populations over 250,000 show the lowest infant death rate, 71.2. The cities of 10,000 to 25,000 population have the highest average rate, 76.

The statistics issued by the American Child Health Association are based on records of the United States Census Bureau, supplemented by preliminary returns from state and local registrars. The report is published annually, with the object of interesting the entire country in the reduction of infant mortality and the necessity for complete birth registration. The Association strongly supports the government's efforts to have the entire country within the Birth Registration Area by 1930, for it feels that a complete record of births and deaths is essential for the carrying out of an effective child health program.

AUTHOR'S SUMMARY.

LEAD POISONING IN NURSING INFANTS. HERBERT B. WILCOX and JOHN P. CAFFEY, J. A. M. A. **86**:1514 (May 15) 1926.

Two cases of lead poisoning are reported in nursing infants. The lead was obtained from lead nipple shields. None of the manifestations in the classic lead triad were present colic, palsy and lead line. The symptoms consisted of vomiting, general nervousness and anemia.

BONAR, Salt Lake City.

VENEREAL DISEASE CONTROL IN THE PROVINCE OF QUEBEC. A. H. DESLOGES, J. Social Hyg. **12**:65 (Feb.) 1926.

The writer notes great diminution in the ravages of venereal disease, which is credited to the efforts of the campaigns directed toward that objective. Their activities have been aided by promotion of moral propaganda through the church officials. Methods employed were both medical and educational. There has been a steady increase in the number of patients treated in the various clinics during the past five years. Venereal patients are treated in every hospital, so as to avoid any possible hesitation on the part of the patient due to fear of being singled out as "venereal." Practitioners report fewer patients of this type, while specialists register an increase. Treatment is commenced early, and the observance of secondary symptoms and classic lesions is becoming rare. A program of attack against infantile syphilis is outlined. Reglementation has been abolished in Montreal as a result of the antivenereal campaign. Optimum results of further activities are dependent on education of the public mind as to the danger of contagion.

HOMEMAKERS OF TOMORROW. EDITH HALE SMITH, J. Social Hyg. **12**:257 (May) 1926.

This is the text of an address which was broadcast for the benefit of young mothers. It pertains to the need for proper home training during the preschool years, so that healthy attitudes and proper backgrounds for development of ideals may be attained.

SEX EXPERIENCES OF BOYHOOD. WALTER L. HUGHES, J. Social Hyg. **12**:262 (May) 1926.

This article presents a summary of a study conducted in North Carolina in 1920-1921, under supervision of the Bureau of Venereal Diseases of the State Board of Health, cooperating with the United States Public Health Service. It is based on answers to a questionnaire submitted to a representative group of the state's boyhood, comprising boys from high school, preparatory school and mill. The group was almost exclusively native born. Answers were returned by over 1,000 boys. The average age was 17.5 years, three-fourths being between 16 and 18 years. Replies were in harmony with those obtained in a similar survey made by Dr. Exner in 1915. They indicate that active sex-consciousness becomes manifest at about 12½ years; that sources of early sex knowledge were haphazard in over three-fourths of the cases, and the effect of this information had been distinctly bad. The marked prevalence of masturbation was credited in large part to this factor, and it is believed that appropriate and timely teaching can counteract predisposing inherent and environmental conditions. The answers obtained would indicate that much may be accomplished by integrating sex education with the educational problems of home, school and social agencies dealing with the young.

LEGALIZED ELIMINATION OF THE UNBORN IN SOVIET RUSSIA. HAROLD G. VILLARD, J. Social Hyg. **12**:294 (May) 1926.

Expectant mothers who can establish the existence of an economic or hygienic contraindication to childbirth to the satisfaction of the authorities, are granted the right to have pregnancy interrupted in the state hospitals of Soviet Russia. Such candidates are utilizing these facilities in increasing numbers. In Leningrad during 1924, the legally sanctioned operations were

the equivalent of 21 per cent of the total births. Poverty was the chief deciding factor — almost three fourths of the cases — and ill-health was a cause in about a sixth of the cases. Most of the patients were multipara, over 30 years of age. The incidence of criminal abortions in other countries is cited, and the high incidence of puerperal infection associated with them. As a further justification of the legalized feticide, the state holds that only where the state obligates itself to care for its infants is it justified in insisting on compulsory motherhood. It is believed that the measure will result in lessened poverty and higher eugenic standards.

BOYD, Iowa City.

COFFEE AND TEA DRINKING AMONG CHILDREN. ROBERT ROY IRVIN, M. J. & Rec. **123**:434 (April 7) 1926.

A questionnaire was sent out to medical specialists, from which the following conclusions were arrived at:

1. An astonishingly large percentage of children were found to be coffee addicts.

2. That educational measures against the practice of tea and coffee drinking should be instituted.

3. That a hot drink is not considered strictly essential to the diet of children by the majority of pediatrists and child hygienists. However, many hold that hot drinks and hot liquid foods, such as hot milk, cocoa and soups are often beneficial and desirable.

4. A unanimous opposition to the allowing of beverages containing caffeine to children was found.

The findings of this questionnaire confirm that a large proportion of our children are addicted to a habit which is not only of no benefit to them and which interferes with sufficient milk being consumed, but which is also of distinctive harm.

SOME CLINICAL ASPECTS OF HUMAN SEX GLAND MALDEVELOPMENT AND ITS POSSIBLE RELIEF. MAX THOREK, M. J. & Rec. **123**:743 (June 2) 1926.

The author reports a case of pseudohermaphroditism. He illustrates the clinical characteristics by photographs. The patient had been considered a female and was at school as such, at the age of 7 years. At this time the physical development was that of a child of 12 years. Mentally, she was classed with subnormal children. The development of the penis had apparently caused the child's sex to be doubted and she was changed to a boy.

WILLIAMSON, New Orleans.

SEX PROBLEMS IN CHILDHOOD, WITH PARTICULAR REFERENCE TO MASTURBATION. HENRY M. GRANT, Northwest Med. **25**:432 (Aug.) 1926.

In an article referring particularly to adolescent masturbators, Grant recommends a gradual cessation of the habit, with explanation to the patient. Mention is made of the infrequency of deleterious results. The patient is encouraged, and his will and self-respect are built up.

SCOTT, Philadelphia.

OXYCEPHALY. DAVID M. GREIG, Edinburgh M. J. **33**:189 (April), 280 (May), 357 (June) 1926.

Greig has made a distinct contribution to the subject of oxycephaly in this extensive monograph which runs through three numbers of the journal. There

are numerous drawings and photographic inserts made possible in part by a Carnegie University Trust grant. The author presents from original cases the clinical features dependent on the malformations, the detailed description of the skull, and the difference between true oxycephaly and the somewhat similar deformities of the head which are confused with it.

True oxycephaly is present at birth, but heredity is not a factor in most of the cases reported. The deformity is a result of synostosis of the craniofacial bones. It is often but not always associated with syndactylism and other deformities of the extremities. Although there are various degrees and no single concomitant anomaly is always present, one may say that a syndrome exists, which consists of the pointed cranial deformity and in some cases consequent interference with the growth and function of associated organs as a result of the synostosis. Ocular disturbances are not a part of the syndrome, although they may be present and dependent on the cranial deformity.

The writer urges the exclusive use of the term oxycephaly, rather than "tower-skull," "steeple-skull" or the German "Tursmschädel." Many other terms are in use which serve to confuse the nomenclature. Oxycephaly is an historic deformation mentioned in some of the writings of antiquity. Greig refers to the classic description by Homer in the Iliad, of Thersites, a person who had a peaked head and other deformities.

The characteristic is the obliteration of the sutures of the skull and facial bones. Beginning at the bregma, the skull rises to a blunted apex, the orbits are shallow, but not contracted in width. The temporal fossae extend beyond the zygomas and outer sides of the orbit. The transverse diameter of the upper jaw is below normal, with the teeth crowded and irregular in position. The lower jaw is heavy and large in proportion, with regular teeth. The peculiarities of the frontal and nasal bones, as well as the lateral, vertical, occipital, and basilar contours of the skull are described, as well as the cranial fossae.

Greig reports two cases of delayed oxycephaly in children. The condition is not true oxycephaly, and while the tendency is congenital, the deformity, which is moderate, is not present at birth. The fusion of the bones appears later.

False or pseudo-oxycephaly is sometimes mistaken for the true form. Museums have numerous mislabelled specimens. The head in false oxycephaly does not have the fusing of the basal bones or of the facial sutures, it is not congenital or hereditary and there are no associated bone or joint defects, and only one or at most a few cranial sutures are obliterated as a result of some local influence. The height of the head misleads one into assuming that the abnormality is oxycephaly. In the true form the height is due to the fact that in these cases the growing brain during childhood keeps the bones of the calvarium apart, and therefore the edges do not have a chance to touch and undergo synostosis as have the other bones of the head. The apex is near the bregma, while in the false form it varies greatly and often is found to be a projection in the posterior part of the cranium.

Greig states that exophthalmos and impaired vision are common but not invariable accompaniments of oxycephaly. Headaches and proptosis bring the child to the oculist, and there is usually a secondary divergent strabismus. The false variety is apt to have normal eyes. The eye symptoms may not progress further after the brain has reached its maximum size. In infancy, it is not safe to assume from the appearance of bulging eyes that the child has oxycephaly. The optic is the only cranial nerve involved. The mentality

frequently is affected, but in false oxycephaly the intelligence is more apt to be normal.

The facial characteristics are due to the universal synostosis of the facial bones, the flat vertical forehead, and the shallowness of the orbits. The maxillae are poorly developed and contain no sinuses. These children are mouth-breathers. The palate fuses early and does not grow laterally, but the alveolar processes grow downward, and the nasal septum is compressed and bends to the side, causing a deflection of the nose. The pharynx is small and causes difficulty in breathing, noticed particularly while nursing.

The author discusses the instances of peculiarly shaped heads which have been described in the literature as oxycephalic, some of them belonging to geniuses. He believes that many of these are varieties of false oxycephaly or other anomalies of cranial development. There is no doubt that the facts brought out in this treatise will render the recognition of true oxycephaly clearer.

THE VALUE OF SGAMBATI'S TEST IN THE DETECTION OF INFLAMMATORY INFECTIONS OF THE PERITONEUM IN CHILDREN. G. H. DODDS, Edinburgh M. J. **33**:377 (June) 1926.

Sgambati's reaction appears when 2 or 3 cc. of fuming nitric acid is added to 8 to 10 cc. of urine. A positive test consists in the appearance of a bluish-gray color at the contact line. After standing, the reaction is more pronounced and the coloration is diffuse in the fluid. A few drops of chloroform produces a ruby color. The explanation of the reaction is that these colors are produced by oxidation products of chromogens found in cases of peritonitis. The intensity of the color gives an indication of the severity of the clinical conditions. Various writers have denied its specificity.

Dodds has applied the test in 177 cases at the Edinburgh Children's Hospital in the attempt to clear up the question as to its reliability. The test is not pathognomonic of inflammatory peritoneal infections, as the reaction appeared in many cases when no peritonitis was present. The test was positive in all cases of pneumococcal peritonitis, but in appendicitis with peritonitis, it was as frequently absent as present. In routine urine examination of a patient, the reaction appeared when an acute infectious disease developed. Dodds suggests that a transient metabolic disturbance such as causes acetonuria and indicanuria is the explanation of the presence of the chromogen substance which does give a positive reaction.

NEFF, Kansas City, Mo.

PRETUBERCULOUS RHEUMATOID PURPURA. P. CARNOT ET AL., Bull. et mém. Soc. méd. d. hôp. de Paris **50**:695 (April 30) 1926.

Carnot, Libert and Bariéty report the case of a man, aged 40, in whom rheumatoid purpura preceded by a few days a fatal acute pneumonia with tuberculous meningitis. Similar cases seem to be rare; more frequent are those in which purpura occurs during the course of tuberculosis.

ANAPHYLAXIS TO MILK. E. DEBBAS, Paris méd. **59**:506 (May 22) 1926.

The history of Debbas' patient is as follows: During the first three months of life the infant was fed at the mother's breast. Then cow's milk was given; a typical anaphylactic shock with urticaria developed the same day. It subsided on restriction to water and reappeared when milk was given again. Feed-

ing by a wet nurse also entailed two anaphylactic shocks. Desensitization started with 5 drops of cow's milk (mixed with vegetable soup); it was increased by 5 drops every three hours, not surpassing 20 drops the first day. There were no signs of intolerance. The next day, the first dose was 20 drops, increased by 5 to 30 drops. The third day the first dose was 30 drops, increased by 10 to 60 drops. The fourth day a teaspoonful of milk was given at once; the fifth day a tablespoonful, increased to a cup. The cup dose was continued for three days, the quantity of the soup gradually reduced. The infant is now 9 months old; no anaphylactic shocks have been noted to date. It is possible that the exaggerated susceptibility to cow's milk had aroused a latent anaphylaxis to the human milk.

[J. A. M. A.]

THE WEIGHT CURVE OF INFANTS DURING THE FIRST YEAR OF LIFE IN AN INFANT ASYLUM. G. ROI, Clin. Pediat. **8**:162-172, 1926.

The growth of infants in asylums appears to be deficient, retarded and inferior as compared to that of infants reared outside. This is due to various factors. Most of the babies in asylums are illegitimate, and the mothers undergo many physical and mental trials during the period of gestation. There are attempts to abort the pregnancy. They are ashamed of their illegal state and are in constant fear of family ostracism. All these have a very damaging influence on the new-born. The mothers receive the poorest prenatal care, and at the time the infant reaches the institution, it has received no maternal care whatsoever. In the asylum, the frequency of acute infections is great; individual care is lacking; proper equipment and facilities for fresh air and sunshine are often unprovided for and the infant is therefore in fertile soil for the development of rickets and other nutritional disorders. Improper alimentation is perhaps one of the greatest factors. The majority receive wholly artificial feeding. The few that receive breast feedings from their mothers do not obtain its proper value because many of the mothers are reluctant to have the baby live, and so pay little attention to the proper care of the infant.

In recent years, the hygienic conditions of such institutions have been improved and better methods of feeding have been instituted. The daily weight gain has been increased considerably as a result of these improvements, but the curve is still much less than that of infants reared at home.

As a remedy for this condition the auther does not urge abolishment of the infant asylums, but advocates that the expectant mothers receive proper protection and instruction by the municipal authorities. The infants should be nursed by their mothers at definite times, and, if necessary, temporary quarters for the mothers should be provided in the institutions.

ZAMBARANO, Northville, Mich.

THE PERSONAL HYGIENE CAMPAIGN CARRIED OUT IN THE PUBLIC SCHOOLS OF SAN JUAN, PORTO RICO. E. M. IRVINE-RIVERA, Porto Rico Health Rev. **1**:8, 1926.

Great credit is due the teachers of the San Juan graded schools for arousing their pupils' interest in questions of nutrition and personal hygiene. The most striking factor about the campaign is that the children are not only given insight into the value of cleanliness, but they are also made to take part in actual drills in bathing, teeth brushing, shoe shining, etc. In this way a kinesthetic memory is developed, and what might have been only a vague, half forgotten ideal becomes a definitely established habit.

LESLIE, Chicago.

Society Transactions

AMERICAN PEDIATRIC SOCIETY

Thirty-Eighth Annual Meeting, held at Niagara Falls, Canada, May-June, 1926

J. H. Mason Knox, M.D., *in the Chair*

SIXTH SESSION

The Result of Ultraviolet Rays Treatment of Extensive Pulmonary Tuberculosis in Infants. Presented by Drs. Henry J. Gerstenberger and Charles W. Burhans (by invitation).

Pulmonary tuberculosis in infants still is considered generally hopeless, even though in recent years various authors have cited recoveries. The question as to whether the reported cases of recovery were cases of true pulmonary tuberculosis has recently been made more difficult to answer because of the writings of Eliasberg and Neuland, in which they maintain that such pulmonary infiltrations are nonspecific and epituberculous, as they choose to designate them.

The authors, having had excellent results in the treatment of peritoneal and mesenteric gland tuberculosis with the mercury quartz lamp, have used the same therapy within the past two years in cases of pulmonary tuberculosis in infants. The patients forming the basis of this report numbered seven, were kept indoors and were not exposed to the carbon arc lamp. Attention, however, was paid to the diet, and six of the seven infants received cod liver oil straight or in the form of Protein S. M. A.

The ages of the infants on admission were 2, 5, 6, 10, 13, 16 and 17 months, respectively. The general condition in six of the seven was very poor. The pulmonary lesions in six were massive in character and lobar in distribution. In two, the lesion was located in the left upper lobe; in three in the right upper lobe, and in one in the left and right lower lobes. In the seventh, the shadows followed the bronchial tree on both sides. All three of the infants having massive infiltration of the right upper lobe presented or developed cavities which entirely disappeared. This observation is especially important in view of the fact that Eliasberg and Neuland would have considered these cases as epituberculous had not these cavities appeared. The intracutaneous tuberculin tests were positive in all cases. In four the reaction was very marked to a dilution of 1:1,000, and in one it was definite but not markedly positive to a dilution of 1:1,000, in another to 1:100 and in a third to a solution of 1:10. One of the three patients presenting a cavity reacted markedly to the tuberculin test. This patient also developed tuberculous peritonitis. Another patient developed tuberculous peritonitis and a phlyctenular conjunctivitis, and likewise had a very markedly positive tuberculin test. No correlation, therefore, existed between the degree of sensitiveness to the tuberculin test, and the extensiveness of the tuberculous processes in the lung.

At the end of the period of observation, which was at least one year in six cases and two years in the seventh, the lungs were clear in five patients,

four of whom, however, still presented enlarged bronchial glands. In one patient the lung area in the hilum region was still cloudy, and in the last patient a dense shadow remained in the right upper hilum region, which looked like a small mass of much shriveled lung tissue.

The gain in weight, once improvement had started, was excellent in all but one subject, and in this patient the improvement in the disposition and general condition was decided. The authors realize that the rest in bed, even though indoors, and the diet, which included milk, cod liver oil and orange juice, probably had something to do with the improvement in the cases reported. Nevertheless, it is their impression, from the experience obtained with these cases, that exposure to the ultraviolet rays was of value. At any rate, even though it was continued in the presence of extensive pulmonary lesions, emaciation and high fever, final recovery took place and evidently at least no harm was done.

The conclusions are as follows:

1. Tuberculous infants showing extensive pulmonary infiltration, even with cavity formation, may recover. Seven cases covering an observation period from one to two years are reported.

2. From the experience obtained in these infants, it seems that pulmonary exudates that are massive in character and lobar in distribution are peculiarly inclined to improve.

3. The question is raised whether the good results obtained in the type of cases reported is not due principally to the fact that such infiltrations are a part of a beneficial and general immunologic attack of the body against the tubercle bacillus, rather than the results of the local success of the tubercle bacillus.

4. All of the reported cases were exposed at least on an average of three times per week to the quartz mercury arc lamp, and it is the impression of the authors that they were benefited thereby. It is certain that no harm was done.

DISCUSSION

DR. BARTLETT: In how many of these children were bacilli found in the sputum, and what was the technic of the irradiation, the frequency and the time of exposure?

DR. GERSTENBERGER: To answer Dr. Bartlett's question, let me say that we did not attempt to find the tubercle bacilli, principally because it is very difficult to find them in infants even when they are present in the sputum or in the stools, and then a negative finding would have meant absolutely nothing.

The schedule of exposure to the ultraviolet rays was the one ordinarily used in treating rickets. The initial distance was usually 80 cm., and the final distance 60. The initial exposure period was three minutes, and the last twenty, and some of the patients were exposed daily, but most of them every other day.

Giving S. M. A. or cod liver oil possibly did play a rôle in bringing about an improvement in these cases. Nevertheless, as stated before, we feel that, clinically, something more was accomplished by the use of the ultraviolet rays. Clinically, the children seem to continue on a better plane after their use.

PATHOGENESIS OF SPORADIC CRETINISM. Presented by DR. CHARLES HERRMAN.

The symptoms of *Sporadic cretinism* are not due solely to hypothyroidism; other members of the endocrine system, more especially the anterior lobe of the pituitary gland are probably involved.

As Biedl says, the thyroid gland if not the conductor is at least the first violin of the incretory concert. The absence of thyroid secretion probably impairs the function of the pituitary gland.

In some mammals, the removal of the anterior lobe of the pituitary gland causes a retardation of skeletal growth similar to that caused by thyroidectomy.

In tadpoles, thyroid feeding causes a rapid metamorphosis, unassociated with any increase in size.

According to the latest view (Kendall), the thyroid secretion acts as a catalytic substance, and stimulates chemical changes in all the cells of the body. The increased metabolism results in metamorphosis.

In sporadic cretinism the absence of this stimulation causes delayed metamorphosis which manifests itself in retardation of skeletal growth, dentition, closure of fontanels and sutures, and the umbilical ring.

Disturbances of thyroid function, as shown by enlargement, are common even in regions (supposedly) free from endemic goiter. The enlarged thyroid gland being visible and palpable is not easily overlooked; hypothyroidism is not so easily detected.

There are individual differences in the functional efficiency of the thyroid gland. Inefficiency may not be evident until an extra demand is made on it by infection, toxemia or psychic trauma. Such a congenital inferiority is analogous to Gowers' abiotrophy, a defect in vital endurance.

Heredity plays an important part in the disturbances of the thyroid gland. Several subjects in one family may be affected. Such disturbances may be of a different character in each, and the tendency may manifest itself in disturbances of other members of the endocrine system.

In cases of sporadic cretinism the family history may show little evidence of disturbances of the endocrine system, because, previous to 1890, the successful treatment of hypothyroidism with thyroid extract was unknown, so that these patients were sterile; defective embryos fail to mature, or if they mature may be stillborn or die shortly after birth; the functional inefficiency of an endocrine gland may not manifest itself until late in life, so that patients who die young may show no definite signs of such inferiority.

Endemic and sporadic are relative terms. Enlarged thyroid glands are not uncommon in regions (supposedly) free from goiter. There are no pathognomonic symptoms which serve to differentiate between endemic and sporadic cretinism. Those which are usually given are not sufficient.

It seems probable that in districts in which cretinism is endemic, besides injurious unsanitary local conditons, which put an extra burden on the thyroid gland, there is an inferior degenerated stock. Villages situated in mountainous districts were segregated until recently. Hypothyroid subjects, being inferior, less ambitious and adventurous, would remain at home, and as their choice would be restricted, intermarriage would be common. This would favor the appearance of unfavorable recessive factors. In this respect, consanguinity would be a contributing cause. If subjects carrying these unfavorable recessive factors migrated to other countries, some of their children might be hypothyroid, and would be considered cases of sporadic cretinism.

INFANTS IN SIAM. ABSTRACT. Presented by DR. H. M. MCCLANAHAN.

This paper included a brief description of Siam, the chief industry of which was rice growing. The people are of small stature. Owing to the climate, they lack energy and initiative. The infant mortality is high; it is estimated to be from 50 to 75 per cent during the first year. Causes of death may be difficult

labor, lack of obstetric care, a small supply of breast milk, improper methods of feeding, such as masticated rice and ripe banana, intestinal indigestion and infections, and intestinal parasites. The mortality among the foreigners, with proper care and medical attention, is very low. The children of foreign parents seem normal in health and development.

THE SUPPOSED CORRELATION BETWEEN THE RATE OF GROWTH OF THE SUCKLING AND THE PERCENTAGE OF PROTEIN IN THE MILK OF THE SPECIES. Presented by DR. GROVER F. POWERS.

Bunge and his pupils, Pröscher and Abderhalden, correlated the rate of growth of the suckling of different species of animals, as evidenced by the time required to double the birth weight, with the percentage of protein in the milk of the lactating female of the species. It was found that the rapidity of growth of sucklings of the nine species of animals studied is directly proportional to the percentage of protein, calcium and phosphorus in the milk. From these observations the generalization has been made, and seems to have been universally accepted that the proportional correlation between the percentage of protein, calcium and phosphorus in the milk of the species and the rate of growth of the suckling denotes a remarkable provision of nature and may have a cause and effect relationship. Abderhalden states: "The fact that the milk of different species of animals varies greatly is of much significance. The composition of the milk evidently has an effect on the rate of growth of the suckling. It is natural to expect that the richer the milk is in the organic and inorganic constituents, the more rapidly the suckling is able to build up its tissues. If the milk of different species of animals all had the same composition, then the desired effect could be produced only by means of a much greater production of milk, and similarly a correspondingly greater quantity would have to be taken into the system of the suckling."

It seems doubtful whether such deductions from the data available are justified. If the facts concerning the water buffalo and reindeer had been included in Abderhalden's table, the correlation between rapidity of growth and the percentage of protein in the milk could not have been made. Furthermore, even in Abderhalden's table as it stands, the percentage differences between the protein in cow's milk and in goat's milk is exceedingly small — much less, in fact, than the normal variation in analyses — whereas the days required for the suckling of these two species to double its birth weight is very great. For the small animals (the cat and rabbit), the differences in time required to double birth weights is very slight, and the accuracy of the milk analysis may be questioned, because of the difficulty of obtaining satisfactory samples.

If all the available accurate data on the milk of different species of animals are expressed, not in terms of the solid and water constituents together (volumetric percentage) but separately, in terms of calories and concentration, the correlation pointed out by Bunge seems to lose its significance. Rapidity of growth cannot be brought into relationship with any energy-yielding constituent of milk, least of all with the protein. The percentage of total calories in protein is remarkably close to 20 in the milk of all species of animals, except man and the elephant; in the milk of these two species, the percentage of total calories in protein is less than 10. The concentration of the milk of the various species varies directly with the percentage of total calories in fat, and inversely with the percentage of total calories in carbohydrate. The amount of ash per calory varies inversely with the concentration. There is an approach to parallelism, in some instances, between the rapidity of growth of the suckling and the concentration of the milk of the species, but the exceptions are many and decisive.

Furthermore, no striking relationship exists between the habitat or size at birth of the suckling of different species of animals, and any of the energy-yielding components of the mother's milk or with the concentration thereof. I believe we are wholly in the dark as to the meaning of the differences in the total concentration, and in the concentration of individual constituents of the milk of different species of animals. Differences and peculiarities in the composition of the milk are expressive of the individuality of the species just as are the host of other characteristics, physical and psychic, sui genesis for the species.

AN EPIDEMIC OF UNDETERMINED NATURE. DENGUE? Presented by DRS. FRANK S. CHURCHILL, Milton, Mass., EUGENE M. LANDIS (by invitation) Philiadelphia and S. DAVID GLUSKER, Philadelphia (by invitation).

During the summer of 1925, at Cape Cod, there occurred an epidemic characterized by a sudden onset with a rapidly rising temperature, pain of varying degree located in the abdomen and back, especially over the lower ribs and at the epigastrium, increased by normal breathing; occasional chilliness, never a chill; occasional vomiting, rarely sore throat, never convulsions; an indefinite physical examination; persistence of these symptoms for a short length of time, varying from twelve or eighteen hours to one or three days; then remission of fever and general symptoms in turn lasting from twelve to thirty-six hours; followed by a second "peak" of temperature and recurrence of the same symptoms, all constituting the so-called "diphasic course"; final subsidence of temperature to subnormal, with prostration and a slow convalescence. We saw fifty cases in all, thirty-nine of them children, often a whole family being affected. Laboratory studies were of little significance. The urine was normal. The blood showed generally polymorphonuclear lymphocytosis, and a few cases of marked leukopenia, as low as 2,600.

Several groups of mosquitoes examined showed none which were known to be disease carriers.

Diagnosis: The histories of nine cases were made up of the details sketched in the foregoing. They suggested one of three things: Influenza, "pleurodynia" or dengue. There was little resemblance to epidemic influenza; the summer season, the absence of respiratory signs, and the sharp localization of the pain were unlike any picture of influenza which we have observed in either army or pediatric practice. We may exclude influenza.

With reference to "pleurodynia" and dengue, "pleurodynia" is a term applied to a symptom complex occurring in epidemic form and heretofore observed only in the summer season of the temperate zone, first in Virginia in 1888, then in Philadelphia, New Jersey and New York City in the summers of 1923 and 1924. The symptoms of our epidemic are essentially identical with those described by various authors in the before-mentioned epidemics, but "pleurodynia" is a symptom or rather group of symptoms. Is it a clinical entity, or is it a manifestation of a specific, already classified, disease?

The symptoms suggest dengue a tropical disease, due to a filter-passing organism conveyed by the stegomyia mosquito. But this mosquito does not exist at the latitudes where any of these epidemics of "pleurodynia" have been observed. Consequently, either these cases are not dengue, or there is more than one carrier of the latter's virus. If such an additional carrier exists, it presumably is a mosquito and a species found in abundance in both the tropic and the temperate zones. Such a species is *Aëdes Sollicitans*, the only one found by us in the present study likewise existing in the tropics. It has never been suspected of

transmitting disease, consequently has never been so tested. We believe that in future epidemics of "pleurodynia," biting experiments should be carried out with both the *Aëdes Sollicitans* and the stegomyia mosquitoes, that the blood of patients should be examined for the dengue virus, and also that the spread of dengue through the sollicitans as a carrier should be investigated. At present, lacking the information which these studies would give, we do not feel that we can exclude a diagnosis of dengue in the present epidemic.

The treatment was merely symptomatic, especial attention being given to the convalescent stage to prevent overexertion.

DISCUSSION

DR. PLACE: I am greatly interested in Dr. Churchill's account of this epidemic. There have occurred during the past year in this section three other epidemics similar in character to dengue. While these have more or less common factors of acute onset, painful or aching joints, toxic symptoms, recurrent type of fever and sometimes eruption, there is doubt of a common etiology. It may complicate the question by referring to an epidemic recently seen by us, which occurred in January in a city of 50,000 about 50 miles from Boston. The onset was abrupt, with high fever and toxic symptoms. The fever tended to abate in three to four days and then recur, and in the severer cases run a secondary curve of one to two weeks' duration.

A blotchy, measles like or rubellaform eruption appeared about the second to the fourth day, chiefly on the extremities and often periarticular. In severe cases this eruption was generalized. There was a marked tendency to hemorrhage into the lesions, especially about the ankles and on the soles of the feet.

The joint involvement was a striking feature. It was usually polyarticular and often very severe. The joint symptoms in a moderate percentage consisted of definite tenderness, swelling, increased heat and in some cases extensive fluid accumulation especially in the knees. In others, there was marked pain and tenderness in joints without objective symptoms. The spleen was not enlarged, and there was no cardiac involvement. There was usually a slight leukocytosis, rarely a leukopenia.

The epidemiologic facts were quite clear. The epidemic occurred in a small compact section, one-half mile long. All the cases, with two exceptions, were found to take a common milk supply. Blood cultures and cultures from the fluid from the knee joints of two of the cases showed a long filamentous bacterium pleomorphic and apparently belonging to the higher bacteria. Parker has found that the blood of these cases contain agglutinins for the organism, while no control blood has shown any.

An epidemic of exactly similar character occurred in Chester, Pa., one year ago. These extraordinary epidemics of dengue type are certainly very interesting, and I speak of this one in addition to the strange epidemic of Dr. Churchill's because of the possibility of other similar epidemics in the future.

DR. CHURCHILL: I reported this epidemic in the hope that some of the southern members might be able to throw some light on it. At the Marine Biological Laboratory at Woods Hole, there are men who have worked in the tropics. One man said the disease looked very much like dengue. And another said, "If I were in the tropics I would say I had dengue." Others said it was very suggestive of dengue. I have never seen a case of dengue, unless that was what I saw last summer. Another interesting feature: To the east along Buzzards Bay there were various centers where there were foci of the disease, 15 miles east at Wianno, 30 miles east at Hyannis and 60 miles east at Chatham. But there was none at New Bedford, west across Buzzards Bay.

CEREBRAL BIRTH PARALYSIS: SOME FACTORS WHICH INFLUENCE PROGNOSIS AND TREATMENT. Presented by DR. T. C. HEMPELMANN.

Two hundred and thirty-eight children with spastic paralysis were examined at the Shriner's Hospital, St. Louis, in consultation with a neurologist and orthopedic surgeon. It was found that the severest manifestations of the disease, with least tendency to improve, occurred in those children with athetosis, ataxia and mental deficiency. The following criteria were recognized as being most favorable for treatment: (1) The child must be of normal mentality; (2) he must give a history of improvement in his condition; (3) he must not have athetosis or marked incoordination of movements other than those due to spasticity; (4) he must be willing and old enough to cooperate in the post-operative treatment.

The treatment consisted of efforts to overcome contractures, followed by neurectomy of the nerves of supply to the spastic muscles, and careful post-operative training intended to develop weak muscles and thereby reestablish the balance between the opposing muscle groups. In the lower extremity, resection of the nerves was carried out on the obturator nerves (sectioned within the pelvis and above the branches), the sciatic branches to the hamstrings, and the popliteal branches to the gastrocnemius and soleus muscles. In the arm, neurectomy was performed on the median nerve branches to the superficial head of the pronator teres, as well as partical division of the nerve supply to the flexors of the wrist, fingers and thumb.

The postoperative care is extremely important, for the improvement is usually directly proportional to the amount of power developed in the congenitally weak muscles. The leg muscles in which such weakness most often occurs are the gluteals, the quadriceps and the dorsal flexors of the foot, and walking is not attempted until by means of passive and active exercises, a return of power is demonstrable in these muscles. Exercises in walking are greatly facilitated by placing the patient erect in a large tank of water until he develops a sense of balance, and later continuing his training in a large sized infant walker, or while supporting the arms by parallel bars. Such reeducational measures must be long continued and skilfully directed, but if faithfully carried out, the improvement is often extremely gratifying.

DISCUSSION

DR. HELMHOLZ: I have been very much interested in Dr. Hempelmann's paper. It is an interesting topic because it seems to offer some help to a rather hopeless group. I agree with what has been said of operative procedure. Our experience with ramisection has been disappointing. I want to emphasize what Dr. Hempelmann has said regarding the relaxing effect of bathing; apparently there is a relaxation of the spasm and the support of the water gives confidence to walk earlier than they otherwise do.

DR. FOOTE: It is very significant that there is so much confirmation of Schwartz's work, and that a great deal of light has been thrown on the newer pathology of this condition. Formerly it was thought that the injury was principally to the motor area, but now it is realized that injuries at the base and in the midbrain and cerebellum are the most frequently found lesions. Dr. Wilson of Brooklyn, as well as Dr. Adair of Minneapolis have recently obtained results fully confirming Schwartz's work.

It is interesting to observe that pathologic concepts are changing, and that as in this case, a newer knowledge of morbid anatomy is being reflected in the treatment.

DR. HEMPELMANN: This "orthopedic paper" was suggested by the fact that we had a number of splendid motion pictures showing children with spastic paralysis before and after operation. Unfortunately, however, some weeks ago one of the films caught fire, and all were totally destroyed.

TWO CASES OF SCURVY WITH ROENTGEN-RAY OBSERVATIONS. Presented by DRS. PHILIP VAN INGEN and JOSEPH M. STEINER (by invitation).

Both patients were very rachitic and much undernourished boys. Roentgenograms were taken to show how soon the hemorrhage could be demonstrated and how long it lasts.

Case 1.—P. R., a boy, aged 11 months, had marked swelling of left thigh and leg. The gums were bleeding. Hemorrhage was not definitely shown till the twentieth day, and then it involved the joint with separation of the epiphysis,

Fig. 1 (case 1).—The patient on admission.

as well as stripping the periosteum of the femur for fully two-thirds its length. At 59 days of age, there was practically no change in size, when the child died of extensive bronchopneumonia.

Case 2.—V. H., a boy, aged 14 months, had swelling of both thighs and the right shoulder. The gums were bleeding. At the age of 21 days, hemorrhages were demonstrable, involving both femurs, the right tibia and the right humerus. At 66 days, considerable absorption was shown. At 208 days there still was evidence of lesions.

DISCUSSION

DR. FREEMAN: Am I right in assuming that in the first case there was no hemorrhage on the other side?

DR. VAN INGEN: Entirely, just one side was involved.

DR. FREEMAN: I do not remember having seen such an extensive hemorrhage with only one side involved.

LOCAL SCLEROSIS OF THE HEART IN AN INFANT. Presented by DRS. A. GRAEME MITCHELL and R. N. SPECKMEN (by invitation).

This report was on a colored female infant aged 19 months, who was discovered to have a greatly enlarged heart. At first it was thought that the diagnosis was pneumonia of the left lower lobe but the fact that cardiac pulsations could be felt as far to the left as the midaxillary line suggested that the entire pathologic change in the left side of the chest was due to an enlarged heart. By

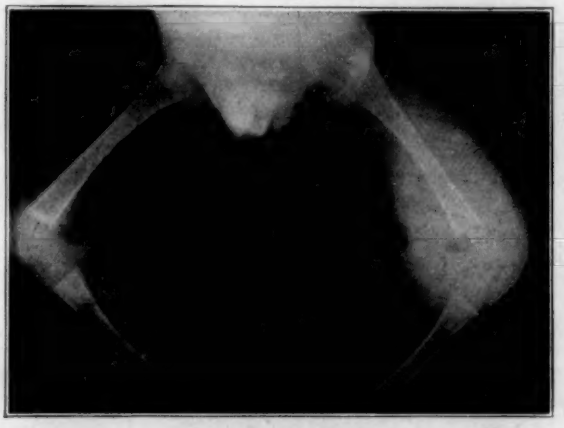

Fig. 2 (case 1).—The patient at the age of 20 days.

Fig. 3 (case 1).—Patient at the age of 59 days, when death occurred.

taking roentgenograms in various positions, including the lateral, it was demonstrated that this was the case. The Wassermann reaction of the blood was negative. Necropsy disclosed an enormous heart, the weight of which was that of the heart of a child aged 12 years. The thickness of the ventricular walls and the diameter of the valves were correspondingly great. A large area of fibrous tissue was found in the left ventricular wall, resembling that which

occurs in adults connected with disease of the coronary artery. There were several infarcts in the kidneys. It would seem that the child at one time suffered from a general infection of a septicemic nature. The only previous infections which the child had had were acute otitis media at 8 months of age and chicken-pox at 10 months. It seems likely that it was the former which was the starting point of the blood stream infection. During life, there had been no clubbing of the fingers, no demonstrable cyanosis, no cardiac murmur or thrill and the right side of the heart was not enlarged to any extent. In view of the facts previously stated, the diagnosis before death was idiopathic hypertrophy of the heart. It was only necropsy which could disclose the true state of affairs.

STUDIES OF A PATIENT WITH THOMSEN'S DISEASE. Presented by DRS. ALFRED HAND and ALVIN E. SIEGEL (by invitation).

Lantern slides were shown of a girl, aged 4 years, with general hypertrophy of all the skeletal muscles, which were in a constant state of great tonicity,

Fig. 4 (case 2).—The patient at the age of 21 days.

hindering all voluntary movements; the condition was first noticed in infancy. A younger sister is similarly affected, and the family history is said to be negative.

Studies of metabolism showed a diminution in the blood calcium content, and a slight elevation of blood sugar, other estimations being normal.

GLYCOSURIA OF THE NEW-BORN TREATED WITH INSULIN. Presented by DR. W. R. RAMSEY.

The following case report is of a boy, born Oct. 20, 1925, at full term, of normal delivery, the birth weight being about 2,200 Gm. The parents were Hungarian, aged 33 years. There are five brothers and sisters living and well; one child was stillborn.

The patient was first examined when 18 days old at the Infant Welfare Clinic. He weighed 2,220 Gm., was small, and looked like a premature baby. The heart, throat, lungs, abdomen and skin were normal. The mother was advised to nurse every three hours, express the breasts and complement with one half milk mixture plus 5 per cent sugar.

The patient lost 285 Gm. in one week, and was admitted to the Childrens' Hospital, Nov. 23, 1925, at the age of 4 weeks and 3 days. He weighed 2,085 Gm., had fever, and an upper respiratory infection, was malnourished, drank large quantities of water, took his feedings ravenously, perspired profusely and had polyuria. The urine contained a large amount of sugar.

Fig. 5 (case 2).—The patient at the age of 29 days.

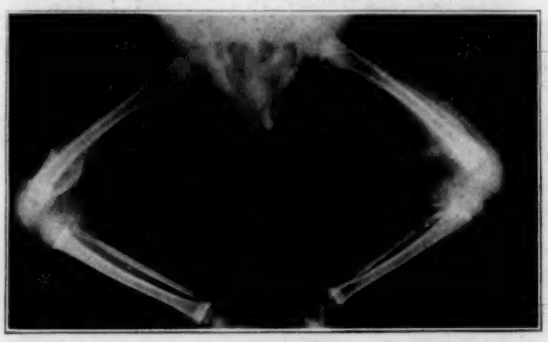

Fig. 6 (case 2).—The patient at the age of 66 days.

The feeding at this time consisted of breast milk and protein milk, 220 calories per kilogram of body weight. Repeated urinalysis showed sugar, therefore the intake was reduced to 140 calories per kilogram. Physiologic sodium chioride was given intraperitoneally daily. The patient continued to lose, weighing 1,830 Gm. on the sixth day in the hospital. Then 0.5 units of insulin was given every three hours before each feeding, resulting in an immediate gain in weight, the urine becoming sugar free on the fourth day of treatment.

The insulin was discontinued, sugar appearing in the urine ten hours later. Insulin was resumed, the urine becoming sugar free in two days. Insulin was discontinued a second time, and sugar reappeared within forty-eight hours. The blood sugar at this time tested 0.225. Insulin treatment was again resumed, the patient becoming sugar free in seven days, remaining so on a feeding of whole lactic milk. The insulin therapy covered a period of eighteen days.

Nine days after finally discontinuing insulin, the carbohydrate tolerance was tested by adding Karo syrup to the whole lactic acid feeding. Sugar appeared on the addition of 3 per cent Karo. At this time the blood sugar tested 0.263. On omiting the Karo, the urine became sugar free, and blood sugar tested 0.075.

The child gained 1,570 Gm. during the six weeks of hospital care and left the hospital on a diet of 600 cc. of whole acid milk, 120 calories per kilogram.

January 20, three weeks following hospital discharge, Karo was again added to the feeding, sugar appearing in the urine on the addition of 2.5 per cent Karo syrup. The urine became sugar free promptly on the withdrawal of the Karo.

Fig. 7 (case 2).—The patient at 208 days of age.

February 17, six weeks following discharge from the hospital, the tolerance again was tested by adding Karo to the feeding, sugar appearing on the addition of 2.5 per cent Karo. February 22, one week later, the tolerance had increased to 2.5 per cent additional Karo. March 17, at 5 months of age, the patient weighed 5,800 Gm., and tolerated 4.5 per cent carbohydrate in addition to 1,000 cc. of whole lactic acid milk.

May 15, at 7 months of age, the child was in excellent condition, and weighed 7.9 Kg. The diet consisted of whole milk, cream of wheat, vegetables, orange juice and cod liver oil. The urine was sugar free.

DISCUSSION

DR. CHURCHILL: I would like to ask Dr. Ramsey if any progress has been made in the study of the heredity of this condition. Is there anything special about the family history in this case? I ask this because I have watched three

generations with this history: In the first case the mother was very fond of candy, but had marked intolerance for sugar. Two of her children showed marked intolerance for sugar and as infants could take but little lactose; otherwise they were normal. Another daughter in due course of time married and a baby was born, which at the age of two years developed diabetes. I wonder whether the intolerance for sugar of the mother and aunts was related to the development of diabetes.

DR. RAMSEY: There was a history of diabetes. The child now has a perfectly normal tolerance for sugar.

NORTHWEST PEDIATRIC SOCIETY

Rochester, Minn., June 18, 1926

C. A. STEWART, M.D., *President, in the Chair*

ANATOMIC CONSIDERATIONS IN RELATION TO INFECTIONS OF THE PARANASAL SINUSES. Presented by DR. H. A. HARRIS.

Roentgenograms of embryos were shown to indicate the importance of the development of the diarthrodial joints between the lateral masses of the cervical vertebrae and of the neurocentral articulations. The former persist into adult life and the latter ossify during the third and fourth years. Injuries or disease therein may cause a torticollis or spasm simulating meningismus.

Roentgenograms of the developing skull of the embryo were employed to demonstrate the growth of the ear, paranasal sinuses and teeth. The skull changes from birth to maturity were traced, with special reference to the cycle of changes in the structure of the skull bones, the eruption of the permanent dentition and the growth of the paranasal and mastoid sinuses. The constituent parts of the temporal bone were indicated and their persistence as distinct entities during babyhood stressed. This anatomic character accounts for the atypical nature of the spread of pus in middle ear infections in infants under 2 years of age. The inflammatory swelling may be anterior, posterior, superior or inferior to the external auditory meatus, and the direction of spread may be along the lateral sinus, internal jugular vein, through the tegmen tympani to the cranial cavity, or may simulate retropharyngeal abscess.

The operation of double mastoid antrotomy in infants was discussed from the point of view of its severe mortality, and a plea was made for careful examination and treatment of the teeth and tonsils. It was pointed out that, as yet, the more revolutionary advocates of the radical surgical procedures in infections of the upper respiratory tracts have not presented satisfactory bacteriologic evidence of the peculiar limitation of the organisms to the middle ear, or to the undeveloped sinuses as compared with their distribution in the nose, throat and trachea.

DISCUSSION

DR. AMBERG: Caution is necessary for those of us who have not been able to see the same kind of material as that which has been reported. Here, in Rochester, when we consider the relationship of upper respiratory infection to nephrosis, we certainly have not been able to establish that close connection with disease of the sinus or middle ear which we have been led to believe is the case in all circumstances. We are dealing with another matter that is

perhaps the most important feature. At a meeting of the American Medical Association, a physician from Iowa made the remark that they very rarely see cases of appendicitis in their vicinity. We see a great many. They may see more infection of the middle ear than we do, and there is the possibility that it may perhaps be overstressed. We are more or less on one side or on the other in this question, and it is very interesting to hear the opinion of an unbiased observer.

DR. SCHLUTZ: I think that many of us take a very conservative position in this matter, and I believe that Dr. Harris mentioned the proper acid test. I know personally that I would like to see these very aggressive clinicians culture their material and get laboratory proof of what they really have. It has been difficult for me to line myself up with their views.

DR. HELMHOLZ: I feel, very much as the other speakers, that proof in many cases has been insufficient. I refer particularly to the etiologic significance of the presence of staphylococcus in sinuses, particularly in nephrosis. In the cultures we have made of material from sinuses we have found quite regularly the presence of staphylococcus. Staphylococcus is the ubiquitous organism of the respiratory tract, and until its relation to a lesion has been proved definitely, its mere presence certainly cannot be interpreted as of etiologic significance.

DR. HARRIS: There is no doubt that the upper respiratory infections are more frequent in the Mississippi Valley than anywhere else. There is something in the climatic conditions which predisposes to sinus trouble. There is a great deal to be done in this connection, and the bacteriologic test must be done conclusively.

PRECIPITIN REACTION IN SCARLET FEVER. Presented by DR. H. M. KEPLER.

Precipitin reaction was studied in 470 cases, using extracts of nasopharyngeal swabbings over specific scarlatinal immune serums. One hundred and thirty-two tests were on material from nonscarlatinal sources; 10.6 per cent of these gave positive precipitin reactions with specific scarlatinal immune serums, but only five of these positive tests were associated with hemolytic streptococcus.

In two series of tests on material from cases of clinical scarlet fever, 87 were made on twenty-nine cases at intervals up to the forty-seventh day after onset. In the first week of illness, fifteen were swabbed; fourteen of these gave positive precipitin reactions associated with hemolytic streptococcus. Eighty per cent of the cases gave positive reactions during the course of the disease. The six patients giving negative results were swabbed but once from fourteen to forty-seven days after onset. Suppurative otitis media was the most common complication. Hemolytic streptococcus and positive reactions were obtained in 92 per cent of the tests made with material from discharging ears. Positive precipitin reactions persisted longer when complications were present, even up to the forty-fifth day.

In a series of 251 tests, 89 per cent gave positive reactions. Most of these were obtained some time during the first three weeks of illness. Sixty-eight per cent of the positive reactions showed hemolytic streptococcus on culture. In the first week positive reactions were obtained in 44 of 47 tests. Positive reactions after the twenty-fifth day after onset were always associated with complications.

From these studies, it appears that the precipitin reaction is of definite value in establishing the diagnosis of scarlet fever, and that persistence of positive reaction associated with hemolytic streptococcus beyond the third week of illness is common.

DISCUSSION

DR. STEWART: The length of quarantine varies in different cities. In Minneapolis the quarantine was sixteen days or until desquamation was finished, and now it is only twenty-one days. There is no increase in the incidence of the disease since the length of the quarantine period has been increased.

DR. ADLER: Were there any clinical evidences in the negative cases?

DR. KEPLER: The tests were made because someone else in the family had symptoms.

IMMUNIZATION WITH THE LARSON SCARLET FEVER TOXIN. Presented by DRS. R. H. ILER and D. C. LOCHEAD.

From a large number of school children immunized with the scarlet fever toxin material prepared by Dr. W. P. Larson of the University of Minnesota, we were able to follow 783 for from twenty-four to seventy-two hours. Due to the difficulty in obtaining consent of the parents, no Dick tests were made previous to the inoculation. One cubic centimeter of the material containing between 4,000 and 5,000 skin units was injected into the deltoid muscle.

Within twenty-four hours, 464, or 63 per cent, of the 783 children observed showed definite skin reactions, with an area of redness varying from 4 to 14 cm. in diameter. Of the 533 children seen within forty-eight hours, 438, or 79 per cent, showed a definite skin reaction. At the end of seventy-two hours the percentage of children showing skin reactions had dropped to 34 per cent and the majority of the reactions were very faint.

Of the 783 children inoculated, 371, or 47 per cent, had a definite infiltration with this skin reaction. In approximately every case the infiltration disappeared within seventy-two hours. Seven children developed general reactions, with temperature varying between 99 and 102 F., two having chills. Eight children developed rash about the second or third day which lasted for three or four days. Two children showed desquamation.

After an interval of one to two months, 752 children were tested with the Dick preparation sent by Dr. Larson. No controls were used. Positive reactions were found in 34.2 per cent; there were 65.8 per cent negative reactions. In 203 children the standard Dick preparation made by the United Products Company was used in one arm, and the Dick preparation made by Dr. Larson in the other. Of these, 47.5 per cent were positive in both arms, 36.8 per cent showed disagreement, being positive in one arm and negative in the other, while only 15.7 per cent were negative in both arms. When there was a disagreement, the standard Dick preparation was positive while the Larson preparation was negative. Since this work was done, five cases of definite scarlet fever have developed in inoculated children, one of whom was negative to the Larson and positive to the Dick preparation; another was negative to the Larson preparation.

DISCUSSION

DR. SEHAM: To me, the most important conclusion that can be derived from such a course is that we are still in a state of uncertainty regarding the efficacy of the Dick test in determining the degree of immunization against scarlet fever with any of the preparations. I think that work of this kind is especially timely, because we are uncertain as to how to take care of our practice in the matter of general immunization. The difference in the results obtained by Iler and

Lochead, and by other workers, shows first of all that there is still a lack of uniformity in the technic. If one goes over the literature, one is impressed with the discrepancies among the workers. Some are getting a high percentage of positive Dick tests in a certain group, and others are getting quite a low percentage of positive reactions. In regard to the length of time that it takes to immunize with the toxoid, some get a certain percentage of negative reactions after one week, and some obtain a similar percentage after three or four weeks. Should we give Larson's serum or any others that have been put on the market and not guarantee, but recommend, this as a procedure against scarlet fever as we did in Minneapolis, or should we wait? Personally, I have not given toxoid to any families. I feel that as the figures are still very uncertain, we should wait until some time when there is a greater agreement among workers and until we know more about immunity.

DR. SCHLUTZ: What was the dosage?

DR. ILER: It was 1 cc. or 3,000 units into the deltoid muscle.

DR. LOCHEAD: I do not know that I have anything to say that would add to the discussion. My idea at first was to inoculate children living on one side of the city only. However, there was so much demand from the parents of children in other schools that we decided to go through the entire list. A little over half of the school population of Rochester was included. The work has demonstrated that as yet we know little about immunity for scarlet fever.

DR. HELMHOLZ: I should like to give one word of precaution in preventive procedures of this kind. I feel that in such work our patients must understand very definitely that matters are still in an experimental stage, and that we can make no promises of immunization against scarlet fever. When the question was asked me whether I should have my own children immunized against scarlet fever, I thought that it was a good thing, but at the present time we are not in a position, with any method that has been brought forward, to guarantee permanent immunization and we must tell every mother and father that this is in the nature of an experiment and it may or may not immunize. The development of five cases of scarlet fever here in supposedly immune children has done great harm to our program of preventive medicine.

DR. ADLER: I have given 100 children Larson's preparation, 1 cc., 1.5 cc., and 2 cc., and I have had cases of scarlet fever in the same group. My difficulty seemed to be the discrepancies that I ran into in interpreting immunity. I used two toxins in every case; in many cases a third which was a control. I used Larson's toxin against commercial and sometimes two commercial toxins against each other, and I got a hodge-podge of results. I think that the question of these first cases of scarlet fever occurring in the immunized group should not discourage us until we have control cases which have received other types of toxin or have received nothing.

DR. STEWART: Dr. Larson begins to feel that we have not been using large enough doses, and we must strive to get negative reactions with doses from six to ten times the doses now being used.

DR. SEHAM: I think we should know as much as possible about the negative side. In the last three months, of eighty-five nurses, eight in our ward came down with scarlet fever which followed a regular course. They were given immunizing doses from four to six weeks before they came down with the disease.

MILIARY AREAS OF CALCIFICATION OF THE LUNGS. Presented by DR. V. B. DOWLER.

This was a clinical report concerning a youth, aged 13. He was born in a rural district, worked hard on the farm and had chickenpox and measles in childhood. He came in complaining about the inability to move the left side of his face, which had persisted since acute mastoiditis with operation in February, 1924. Any other illnesses were absolutely denied.

Physical examination demonstrated that he was a well developed, robust lad. The heart, lungs, abdomen, bones and skin were all normal. There was peripheral paralysis of the seventh cranial nerve of the central nervous system. The urine was normal; the white blood count was 8,500, the hemoglobin 69 per cent and the red blood cells numbered 5,390,000. The Wassermann reaction, both in blood and spinal fluid, was negative; the Pirquet test was negative. The Mantoux test with 0.02 mg. tuberculin was negative; the Mantoux with 0.1 mg. was negative; the Mantoux with 1 mg., control 2 mm. and the test 18 mm., was positive. A roentgenogram of the lungs showed miliary calcification of both lungs.

This was undoubtedly an instance of healed miliary tuberculosis, which is interesting because of the youth of the patient and the increased dosage of tuberculin necessary to elicit a positive reaction.

FILTRATION EXPERIMENTS. Presented by DR. S. AMBERG.

The filtration experiments were made in collaboration with Dr. Rowntree, using the mesentery of a well anesthetized bullfrog as filtration membrane. This can be easily adapted over a funnel in such a way as to permit suction. The experiments were usually run with a negative pressure of from 2 to 40 cm. of water. In using saline solution for filtration, it is possible at times to obtain a filtrate which does not give a test for occult blood. The work is in its incipiency. Thus far, it seems that keeping the surface of the filter, the pressure and time constant, the filtration in various animals does not proceed with equal velocity. Using a saline solution for the filter, the filtration gradually decreases, releasing the pressure and starting again restores the rate. With increased pressure, the rate of filtration increases. The study of the rate of filtration of different fluids is best done at present by counting the drops filtered in a given time and exchanging the fluids. Cold saline filters slower than warm saline. Some protein solutions differ in rate of filtration from those of saline. Congo red filters readily. The process is not a process of filtration only, but other factors enter, for instance, neutral saline (litmus) comes through alkaline; phenolsulphonphthalein comes through alkaline; the saline filtrates contain protein even when no occult blood is present, and saline filtrates contain more protein than water filtrates. The filtrates also contain some calcium. When strong solutions of glucose are injected into the lymph space, the filtrates contain glucose. In some experiments, the pulse could be seen up to a pressure of at least 40 cm. of water, and at other times the circulation could be seen either by microscope or the magnifying glass, at least in some vessels. By placing a catheter into the ureters, it may be possible to study in addition the rate of absorption from the membrane during filtration.

HAZINESS OF THE CORNEA ASSOCIATED WITH BODY DEFORMITIES. Presented by DR. E. R. HARRINGTON.

Three case reports were given of children with large scaphocephalic heads on short heavy bodies, flexion deformities of elbows, fingers and knees, large abdomens, lumbar kyphoses and, most unusual, a diffuse haziness of the corneae which seemed to involve only the deeper layers of the corneae. An oblique

illumination of the cornea showed a clear epithelial layer. There were no vessels seen to suggest an old keratitis. Two of the children were brother and sister, 4 years and 17 months of age, respectively. In the boy, the abnormalities were noticed at birth and seemed to develop proportionally to body growth; in the girl, the abnormalities were not noticed until the fourth month of age, since which time they had become progressively more marked. The mentality seemed normal in both children. The third case was that of a baby girl, whose large head had been noticed at birth, but whose other deformities had been noted only since about 5 months of age. The deformities were becoming increasingly more marked. Her mentality seemed normal. These cases could not be classified. Four similar cases, reported in the literature were cited, but in no instance had the haziness of the corneae, which was considered by the speaker as the unusual feature of the syndrome, been emphasized. No explanation for the haziness was given, although a failure of the cornea to differentiate fully into the normal cornea was offered as a possible explanation.

RESULTS OF THE MONTHLY PRECIPITIN TESTS FOR POLIOMYELITIS. Presented by DR. H. F. HELMHOLZ.

In 1925, Rosenow first used the precipitin test in the diagnosis of poliomyelitis. He used a salt solution suspension of swabs taken from the nasopharynx, and an antistreptococcus serum used in the treatment of poliomyelitis. In his series, 83 per cent of the poliomyelitis cases, 77 per cent of the contacts and 59 per cent of the normal subjects in the epidemic zone gave positive reactions; outside of this zone only 5.5 per cent were positive.

We have taken a series of 100 cases a month, beginning in July, 1925, to determine the incidence of the precipitin reaction. In the first half of July, the incidence was about 10 per cent; in the second half about 71 per cent; during August 75 per cent; during September 45 per cent and in October it was down to 8 per cent. There were no cases of poliomyelitis during the first half of July; during the second half there were five cases; six cases during August and three cases during September. The percentage of positive reactions from October to June varies between 5 and 15 per cent, indicating very definitely the high incidence of positive reactions during the time when poliomyelitis was epidemic and the marked reduction of reactions with disappearance of active poliomyelitis. The work is being continued to determine the incidence during the summer months.

THROMBOENDARTERITIS OBLITERANS OF THE CEREBRAL VESSELS. A CASE REPORT. Presented by DR. R. L. J. KENNEDY.

The patient was a boy, aged 13 years, of Jewish parentage. He had been well until October, 1924, when the ears became bluish-red. This condition cleared up following treatment with ultraviolet rays. December 30, the fingers and feet became hypersensitive, cold and desquamated. A probable diagnosis of Raynaud's disease was made. About this time, the patient became irritable and acted queerly; for instance, he slapped strangers on the back and tripped his mother, making her fall. There was some fever at this time. In Febraury, 1925, he had a tonsillectomy which was followed by recurring attacks of fever. Ethmoiditis developed with ulceration of the nostrils and of one cheek and one ear. Shortly afterward, the left elbow suppurated and was drained. Then the right ear drum ruptured spontaneously and has drained since. In April, he began to have convulsions and suppression of urine, with albumin and

hyaline and granular casts. The convulsions increased in number and severity, preceded by a tremor lasting from fifteen to thirty minutes. The patient had been more or less comatose. Two blood cultures made elsewhere showed a staphylococcus.

Examination of the boy showed a cloudy mentality. There was poor comprehension and cooperation. He spoke only when in pain. There was some weakness of the left arm and leg, the toes on both feet were swollen and desquamated. Examination of the eyes was negative. The right ear drum showed a large perforation with a mucopurulent discharge. He was able to hear a conversational voice. There was a purulent rhinitis with probably multiple sinusitis. There were several small ulcers around the lips. A roentgenogram of the chest was negative, and one of the sinuses showed both mastoids to be cloudy. There was a moderately severe secondary anemia, the hemoglobin reading 46 per cent, the erythrocytes 2,600,000 and there was a leukopenia, the leukocytes numbering 6,400 with 70 per cent lymphocytes. The boy improved for about two weeks after entrance into the hospital. Then he developed pneumonia and later erysipelas; followed by endocarditis and pericarditis and paralysis of the right arm on the day of death.

Laboratory examinations showed a staphylococcus in the blood culture; albumin, hyaline and granular casts in the urine; a persistent leukopenia and secondary anemia and positive tuberculin test. The clinical diagnosis was staphylococcal septicemia, pneumonia, otitis, pericarditis, endocarditis, sinusitis and cerebral lesions new and old.

In view of the subsequent pathologic changes, the points of importance in the history are the Jewish parentage, the peculiar behavior noted in December, 1924, the convulsions, the mental state at the time of entrance, the weakness of the left arm and leg and the terminal paralysis of the right arm. Interesting pathologic changes were found in the brain; there was an obliterating arteritis of the vessels of the frontal and motor areas. Microscopic section showed areas of softening with the adjacent artery occluded by proliferation of the endothelium. In some of the vessels, in addition to the proliferation, there was thrombosis. This represents the earlier changes. Other areas of these portions of the brain showed an increase in the number of glial cells which had replaced the necrotic tissue. This is the equivalent of a scar in another portion of the body. The case is of interest, first, because of the rarity of the findings, and second, from the standpoint of diagnosis. Occurring in a Jew, it is possibly very closely related to Buergher's disease, but against this diagnosis is the fact that Buergher's disease occurs in somewhat older persons and affects the vessels of the extremities. Perhaps the closest that we can approach to a diagnosis is to call the condition an obliterating type of endarteritis.

ROENTGEN-RAY THERAPY IN ERYSIPELAS. Presented by DRS. E. S. PLATOU and L. G. RIGLER.

None of the usual methods for the treatment of erysipelas has been distinctly successful. Roentgen-ray therapy was given to a series of twenty-eight cases, with unusually good results. A suberythema dose was given at one treatment, and in most of the cases the temperature became normal and the symptoms disappeared within twenty-four to thirty-six hours. The results in this series were compared to a similar series of twenty-three cases treated in the usual manner. The mortality and morbidity of the patients irradiated was much less; the duration of the disease, the temperature and the symptoms were much shorter. There was extension of the process in 12 per cent of the subjects

treated with irradiation after treatment compared to 40 per cent in those untreated. The roentgen-ray treatment was successful in several grave cases in young children and in aged alcoholic subjects. There were no deleterious effects observed, although care must be exercised to prevent loss of hair.

DISCUSSION

DR. SCHLUTZ: Dr. Rigler stated that the treatment had been used almost entirely in adult cases. This disease, particularly in very young children, is extremely fatal. I should like to ask, from a roentgen-ray standpoint, whether the skin of the infant offers a different problem from that of older persons. What is the dosage?

DR. RIGLER: I know that in younger children there is much more susceptibility. One was a new-born infant and three were older infants in this series. We would reduce our dosage in younger children about half.

DR. STEWART: I had two cases of erysipelas; one occurred on the third day of life, starting in the breast and circling the body in twelve hours. Roentgen-ray therapy was instituted, and the erysipelas ceased spreading and began to subside. Apparently the erysipelas was disappearing, but on the tenth day of life hemorrhagic areas appeared on the hands and feet with hemorrhages from these areas and also from the navel. It was thought that the baby died from septicemia, though no blood cultures were taken.

Another case occurred in a child, aged 5 months, in whom the erysipelas involved the lower part of the abdomen and perineal region. Following roentgen-ray therapy, the temperature subsided from 105 F. to normal in eighteen hours, and the evidence of erysipelas promptly disappeared.

DR. SEHAM: I had a chance to see some of the cases in the County Hospital. This report is very encouraging. It is a self-limiting disease, but it is rare that you get such quick results. In the average case it takes from five to seven days, and in these cases it was remarkable how quickly the temperature was reduced and the extension of the erysipelas stopped. The final result ought to be watched, and the ultimate effect of the roentgen ray on these children.

DR. HELMHOLZ: In the cases that we have seen here, we used the quartz lamp with success. At Harriet Lane Hospital transfusion is the treatment of choice. They have not lost a single patient since they have used transfusion. In a very sick child we should not hesitate to use transfusion and, if necessary, the light treatment.

CASE OF GLYCOSURIA OF THE NEW-BORN TREATED WITH INSULIN. Presented by DR. F. G. HEDENSTROM.

A boy, born Oct. 20, 1925, at full term, of normal delivery, weighed at birth 2,200 Gm. (4 pounds, 13 ounces). The patient weighed 2,220 Gm. when 18 days old; looked like a premature infant, was breast fed every three hours, and the complementary feeding was composed of one-half milk mixture plus 5 per cent sugar. He weighed 2,085 Gm. at 4 weeks and 5 days of age, having lost 285 Gm. in one week, was malnourished, had an upper respiratory infection drank large amounts of water, perspired profusely, had polyuria, and the urine contained a large amount of sugar. After six days in the hospital, the weight was 1,830 Gm.; the urine still contained sugar. Insulin 0.5 units was given every three hours before each feeding, resulting in an immediate gain in weight. After eighteen days of insulin treatment, the urine remained sugar

free on whole lactic acid milk. The blood sugar was 0.263 during the glycosuria, and dropped to 0.075 when the urine became sugar free. The carbohydrate tolerance gradually increased, so that at 5 months of age the urine remained sugar free, with an addition of 45 per cent Karo to 1,000 cc. of whole lactic milk. At 7 months of age, the child weighed 7.9 Kg. (17 pounds), and took whole milk, cereals, vegetables, fruit juices and cod liver oil, the urine remaining sugar free.

THE OCCURRENCE OF A REVERSAL OF THE NORMAL CONCENTRATION OF THE URINE IN CHILDREN HAVING ENURESIS. Presented by DR. A. FRIEDELL.

Forty children with enuresis, whose ages ranged from 4 to 13 years, were treated at the dispensary of the University of Minnesota. Careful examination failed to reveal the presence of organic lesions which might be responsible for the condition. Foci of infection when present were removed. The entire group was subjected to the same regimen, which included restriction of fluid intake after 4 p. m., abstinence from tea, coffee and highly seasoned food, retirement to bed at 7:30, using a hard mattress. In addition, each child was given a hypodermic injection of 1 cc. of sterile water, and was assured that this treatment would result in a cure. They were impressed, however, that should a relapse occur, additional injections would be administered.

The psychic treatment proved successful in 87.5 per cent of the cases. In patients whose urine showed a persistent reversal of concentration, in which the specific gravity of the day specimen was much greater than that of the night specimen, the treatment failed. In borderline cases, in which the specific gravity of the urine during the day was equal to or slightly greater than that of the night urine, a cure was obtained, but with more difficulty than in cases with normal concentration.

Book Reviews

THE X-RAY IN EMBRYOLOGY AND OBSTETRICS. By W. A. NEWMAN DORLAND, A.M., M.D., F.A.C.S., and MAXIMILIAN JOHN HUBENY, M.D., F.A.C.R., F.A.C.P. Price, $10.00. Pp. 420, with 259 illustrations. St. Paul: The Bruce Publishing Company, 1926.

This rather unusual book will appeal to the pediatrician from three points of view: It contains material on embryology; on diagnosis of intrauterine position of the child, and on the detection of deformities in utero. The book is well and adequately illustrated, and the references are quite complete. The first half of the book, after an introductory chapter, is devoted to the use of the roentgen ray in embryology. Most interesting perhaps are the evidences of the development of the osseous centers as shown in the roentgenogram. There are, however, many pictures of organs in which the arteries have been injected with nonpenetrable solutions making good roentgenograms. This is especially true of the kidney. Deformities are also referred to. The chapter on teratologic roentgenography is interesting, but not of great practical value. It is, however, quite complete, most of the various types of monsters being shown. On the whole, the book is a worthy contribution to medical literature and, as mentioned before, is well illustrated and annotated.

BLOOD CHEMISTRY COLORIMETRIC METHODS. By W. J. STONE. Ed. 2. Pp. 129. New York: Paul. B. Hoeber.

The author limits the contents of this book to the determination of certain chemical constituents of the blood and urine which have some clinical significance, particularly in metabolic disturbances. Colorimetric methods for determining blood urea, nonprotein nitrogen, uric acid, creatinine, chlorides, sugar and cholesterol are described. A modification of Folin's method for estimating the total nitrogen of urine is added. The titratable acidity of the urine — a procedure of doubtful clinical importance — also is mentioned. The brief comments on the significance of the variations of the important chemical constituents of the blood, as well as the suggestions on the dietary management of nephritis and diabetes, are an added feature which many larger books on blood chemistry lack. The methods selected are reliable, are clearly stated, require relatively small amounts of blood, and can be readily performed in a small laboratory. This volume should be a useful, practical manual not only for practitioners, for whom it is intended, but also for workers in small clinical or hospital laboratories.

KNOCHENWACHSTUM UND KNOCHENAUFBAU. By DR. HUGO MAAZ. Price, 6 marks. Pp. 72, with 27 illustrations. Ferdinand Enke, 1926.

In this small monograph on bone growth and bone building, the author plainly indicates his premises — namely, that bone growth, in the sense of the skeletal normal progressive growth from infancy on, is vegetative, biologic; whereas bone building, in the sense of repair for trauma, the building up of the adolescent bone or for pathologic conditions affecting the bone, is purely mechanical, dynamic.

Bone grows from the inherent growth energy of its bone matrix, which is vegetative. Bone building proceeding from the periosteal and chondral growing bones is more a matter of proliferation and absorption directed by requirements of physiologic activity. Bone is compared to a house. Formless and structureless bone matrix formed by osteoblasts is not a built bone — it is only the building material on which the mechanical work of the osteoblasts and osteoclasts eventually turns out the true bone architecture.

These ideas are applied to pathologic growth of bone, as in a misshapen vertebral body compressed on one side by the spinal curvature scoliosis, so that it is narrower on one surface than on the other. Here the normal vegetative growth being overcome by circumstances resulted in a thicker, heavier bone architecturally on the compressed or growth-thwarted side.

The author applies these ideas to the healing of fractures, explaining thus the greater amount of callus on the concave side of a fracture with angular malunion, as compared to the scant callus on the convex side.

He believes his theories bring us nearer the solution of many of the problems of bone formation. Students of rickets and fractures, physiologists and anatomists will find interesting reading in this exposition.

SURGERY OF CHILDHOOD. By JOHN FRASER. Price, $14.00. Pp. 1152, with 598 illustrations. New York: William Wood & Company, 1926.

For considerable time, a complete ready reference book covering the surgery of childhood has been wanting. Now comes such a work by Fraser from the University of Edinburgh, including within its two handsome volumes all the subject matter akin to the child in his surgical relations.

Congenital malformations and orthopedic deformities, which formerly completed the subjects discussed in the rare volumes on surgery of childhood, are relegated to their rather minor position and the present day real surgical problems of the child are dealt with. Nearly every chapter has some mention of the embryologic development of the part under discussion — a most helpful necessity to a clear understanding of both the pathology and treatment.

Without making an attempt to outline the chapters of this work, the reviewer wishes to praise the excellent chapter on joints — its completeness is exceptional. Likewise the portion devoted to the discussion of the spine is very well illustrated and described. To be highly commended are the conditions given which govern the advisability of operation on spina bifida. Methenamine is still advocated in head injuries.

In the chapters on hernia, the subject is divided quite properly according to the sex of the child. The author advocates careful high removal of the sac in inguinal hernia, but does not believe in opening the inguinal canal as is done in the adult. The external ring is made snug by a stitch or two. A novel method of postoperative dressing is advocated.

Congenital pyloric stenosis comes into its modern importance in this work. After a careful review of the methods used to cure, the Rammstedt operation is advocated.

Possibly the occurrence of appendicitis does not range as high in Edinburgh as in the United States, which may account for the rather scant space allowed this very common surgical condition of childhood. The pathology and differential diagnosis given in the text might be considerably expanded.

Consideration of ordinary orthopedic methods is well enough done. The portion on fractures, however, leaves the reader with an unsatisfied desire for

more specific instruction in treatment and more description of the pathology and prognosis. There is some tendency to dismiss a given fracture with instruction to treat it as in the adult — such a rule practically never holds for a child.

These two volumes fill a long felt want, and will be welcomed by the teacher of surgical procedures in children and the practitioner who needs must make diagnoses and treat many of the ailments of little ones.